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ABSTRACT

This exploratory investigation of the process of defining the information needs of computer users and the impact of that process on information retrieval focuses on communication problems. Six sites were visited that used computers to process data or to provide information, including the California Department of Transportation, the California Almond Growers Exchange, the University of California at Davis, the Systems Data Processing Corporation, and the California State Library. Interviews were conducted with managers, intermediaries, and users of services at each site and observations of the information seeking process were made. It was concluded that the process of defining information needs in bibliographic database settings is analogous to the process in data processing settings, for both involve problem identification, query negotiation, and probing. The method of charging for services, organizational/social barriers, and the shared knowledge of participants regarding each other's work were found to affect the information seeking process. Accompanying the text are 11 data tables, 14 figures, and a 39-item bibliography. A sample query negotiation session, the letter to participating organizations, interview schedules and interview forms, and a site selection list are appended. (Author/JL)

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DEFINING INFORMATION NEEDS OF COMPUTER USERS
A HUMAN COMMUNICATION PROBLEM

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THESIS

Submitted in partial satisfaction of
the requirements for the degree of

MASTER OF ARTS

in

COMMUNICATION STUDIES

at

CALIFORNIA STATE UNIVERSITY, SACRAMENTO

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January 18, 1982
Date

Department of Communication Studies

Abstract
of
DEFINING INFORMATION NEEDS OF COMPUTER USERS
A HUMAN COMMUNICATION PROBLEM

by
Kenneth L. Kimbrough

Statement of Problem

The operation of computer systems requires people with technical knowledge of the rules which govern their use. People who lack knowledge of those rules must rely on computer technicians to translate their needs into the language of computers. Thus the computer technician, as intermediary, must find out what it is that the user needs from the computer. The process of finding out affects the product the user ultimately receives. Thus, the intermediary is confronted with a problem common to any information system, "How to find out what the user wants?"

Sources of Data

Six sites were visited that used computers to process data or to provide information. Interviews were conducted with managers, intermediaries, and users of services at each site. Observations of the process were conducted. Guidelines and aids to the participants were collected.

Conclusions Reached

The process of defining information needs in bibliographic data base settings was found to be analogous to the process in data processing settings. The process involves identification of the problem, negotiation, and probing and is affected by the method of charging for services, organizational/social barriers, and the knowledge participants shared regarding each others work.

Kenneth W. Kirsch, Ph.D.
Committee Chair's Signature of Approval

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The best I save for last. To my wife, Susan, who owns at least half of this thesis and would rather not have had any of it, thank you!! Thanks for all the love, encouragement, treats, and apostrophes. Most of all thank you for the truth. Without you this could never have been done.

**This thesis is dedicated to my children,
Christopher, Amanda, and Joshua**

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1

CHAPTER I

1

HOW TO FIND OUT COMPUTER USERS INFORMATION NEEDS

-1-

3

"If we are in pursuit of game and want to get a shot at a quarry, we must set about it in the right way. A man who persists in stalking game in a place where there is none may wait forever without finding any. Persistence in search is not enough. What is not sought in the right way is not found."

I Ching

1

INTRODUCTION

It is estimated that over 76,000 computers will be operating in the United States by 1983 (DATAPRO, 1979). Over 11,000 of these will be large mainframes (IBM 3031 and larger). The versatility of these high speed, data processing, computing machines is such that there is hardly an area of life in the United States that has not been affected by their introduction. Computers are being used by manufacturers to control production processes. The airlines have developed computer systems to manage world-wide reservation systems without which scheduled air travel would be nearly impossible. Information scientists have devised computer systems that organize printed information on a vast

array of subject areas. The Directory of On-Line Data Bases (1981) lists over 960 bibliographic data bases alone which are publicly accessible. Both governmental and private business organizations have developed management information systems (MIS) that attempt to provide information to aid managers and administrators in their decision making activities. All these computer systems are based on technically complex routines and procedures.

Operation of these systems requires people with technical knowledge of the rules which govern their use which poses a problem for people who need access to the information stored in a computer but who are uneducated in their use. These users rely on computer experts to retrieve needed information. Thus the computer expert has been thrust into the role of an intermediary between the computer and its ultimate user. At some point the intermediary must find out what it is that the user needs from the computer in order to have the computer produce the desired results. The activity of finding out the user's information need affects the product the user ultimately receives. Rooted in the process of defining the information needs of computer users is a problem common to any information system: "How does the intermediary find out what the user wants?" This study was undertaken to explore the answers to that question.

Three research questions were posed and nine variables were identified that might lead to a tentative description of the process.

TABLE 1

RESEARCH QUESTIONS

1. How do organizations define the information needs of their computer users?
2. What are the characteristics of communications among participants of the process of defining users information needs?
3. What indicators are used by the participants to evaluate the quality of the output they receive?

TABLE 2

RESEARCH VARIABLES

<u>VARIABLE</u>	<u>RESEARCH QUESTIONS</u>
I. Organizational Variables	
A. Structure	#1
1. large/small	
2. type of service provided	
B. Procedures	#1/#2
1. high/low institutionalization	
2. high/low formality	
C. Goals	#1
1. high/low congruence between units	
2. high/low congruence within unit	
3. description of goals	
II. Interpersonal Variables	
A. Question Negotiation	#1/#2
1. high/low amounts of interaction	
2. degree of probing	
3. amount of discussion	
B. Shared Knowledge	#2
1. users knowledge of system	
2. intermediaries knowledge of clients' business	
III. Relevance Variables	
A. Timeliness	#3
1. on time, early, late	
B. Accuracy	#3
1. accurate/inaccurate	
C. Completeness	#3
1. complete/incomplete	
D. User Satisfaction	#3
1. satisfied/dissatisfied	

This is a thesis reporting an exploratory investigation of the process of defining the information needs of computer users and its impact on information retrieval. The investigation and its findings are presented in a thesis offered in partial fulfillment of the requirements for the degree of Master of Arts in Communication Studies at California State University, Sacramento.

Chapter One outlines the problem, presents definitions of terms, describes the process in three settings, and presents two models for viewing the process. The methods used to conduct the study are presented in Chapter Two. Results of the investigation and the findings of the study are provided in Chapter Three. Chapter Four presents a summary and discussion of the results and findings.

DEFINITIONS

This section contains definitions of some terms frequently encountered in this study and descriptions of several bibliographic data bases. These terms are used to describe aspects of the operations of computers. It is recommended that the reader have some familiarity with the terms before reading the remaining sections.

application program

A computer program that is used for, or is oriented towards specific problems or application areas, such as inventory control, payroll, sales forecasting, scientific calculations, or data reduction (Weik 1977). Also known as application software and is distinguished from control programs which "observe, regulate, control, or verify the operation of a data processing system" (Weik 1977).

1 data base

A comprehensive, integrated collection of data organized to preclude duplication of data, yet permit retrieval of information to satisfy a wide variety of user information needs (Bohl 1976).

1 data base management system (DBMS)

The software that handles the organizing, cataloging, locating, storing, retrieving, and maintaining of data in a data base (Bohl 1976). Some examples are DIALOG, ORBIT, RAMIS II, SPIRES, and IDMS.

1 management information system (MIS)

The entire collection of procedures, operations, and functions devoted toward the generation, collection, evaluation, storage, retrieval, and dissemination of data and information within an organization or area in order to promote the flow of information from source to user (Weik 1977).

1
program

A plan or procedure for solving a problem with a computer. Also a sequence of instructions or statements in a form acceptable to, and intended for execution on a computer (Weik 1977).

1
software

Data and information that are associated with the hardware of a machine or system. The hardware and software joined together, such as a program stored in a computer, are considered the operating system (Weik 1977).

1
bibliographic data base

A computerized data base containing bibliographic information about a collection of documents. May contain author, title, publisher, and date of publication as well as abstracts and/or the complete or "full" text of the documents cited.

data processing organization

An organization concerned with the operation of computers for the purpose of providing data processing services. Services usually include systems analysis, programming, and computer time.

BIBLIOGRAPHIC DATA BASES

The following bibliographic data bases were encountered during this investigation. The accompanying descriptions were obtained from intermediaries, vendor supplied materials, and the researcher's experience with these services.

DIALOG

A computer system used to search over 110 scientific and social science bibliographic data bases. DIALOG is owned and operated by Lockheed Information Systems, Inc. To use the DIALOG system customers pay a subscription fee plus charges for each data base accessed. Charges are based on the minutes/hours of time connected to the data base and the number and type of citations retrieved. Users have the

option of receiving the results of their search as a citation or citations and abstracts. Some training in the DIALOG system language is required before searches can be conducted. Examples of data bases available through DIALOG are ERIC, CA Search, and PSYCHABS.

ORBIT

A computer system used to search over 60 scientific and social science bibliographic data bases. ORBIT specializes in fields of interest to industry and technology. An example of a data base available through ORBIT is APIPAT, a computerized collection of foreign and domestic patents published by the American Petroleum Industry. ORBIT is owned and operated by Systems Development Corporation. Charges for subscriptions and use are similar to those established for other search systems (see DIALOG description).

BRS

A computer system used to search over 100 scientific and social science bibliographic data bases. BRS provides much the same kinds of services as DIALOG; e.g., access to database like ERIC, PSYCHABS, etc. It is distinguished from DIALOG and ORBIT by the availability of the Books-in-Print data base and a version of the New York Times Information

Bank. Charges for subscription and use are much the same as DIALOG and ORBIT.

New York Times Information Bank

A collection of data bases which provide indexing of articles in the New York Times, Washington Post, selected regional newspapers, and selected national news magazines. In addition, specialized data bases on such areas as defense, the Middle East, and advertising and marketing are available.

MEDLARS

A system for searching literature on medical, health, and related fields. The acronym stands for Medical Literature Analysis and Retrieval Systems. MEDLARS provides access to a variety of data bases in such subject areas as disease, health administration, cancer, toxicology, and bio-ethics. MEDLARS had its beginnings as MEDLINE with the computerization of INDEX MEDICUS under Federal sponsorship. MEDLARS, still under federal sponsorship, charges no subscription fee and only a flat rate for using a data base.

THE PROCESS -- IN A LIBRARY

If a person approaches the reference librarian in a library and asks for directions to "some journals about computers", the librarian, recognizing that the person probably has something more in mind than computers, asks to know a little more about what the person wants. After a few questions, it may be determined that the inquirer wants some current details on the size and scope of the United States computer industry for a business class. The librarian, using his knowledge of available reference materials, may direct the person to an annual industry report which should contain the information needed. The librarian may further suggest that if the answer is not found, to please come back and the librarian will find it.

Let us assume that the searcher follows the librarian's instructions and finds the book on the shelf. After scanning the table of contents, he finds a narrative summary of the computer industry along with supporting tables and figures. The data is noted and the process ended.

Analysis

The process of defining needs began when the searcher made his initial request for "some journals." This step included the discussion and refinement of the question being posed.

As the librarian began to develop a sense of the underlying problem not only was the question being negotiated, but the librarian had begun an internal process of matching up his knowledge of the appropriate resources to the question. In other words, the question was now being translated into the terms (formal language or structure) of the system. Concurrently, the librarian developed a strategy for getting the answer. In the typical library this can entail identifying several reference works, trade journals, and the like along with the instructions on exactly where to find the materials. Armed with a better understanding of the problem and with directions to resources the user then finds the material, browses them, retrieves the relevant data, and is finished. The search has now been executed, a result obtained, and a judgement of its relevance to the problem made. All that remains is to transmit this judgement of relevance back to the the librarian.

Often the relevance judgement is that the resource is not what is needed or that more is needed. In this case, the relevance judgement may reach the librarian through a request for further information or directions. Unfortunately, if the librarian never hears from the user again, he has no way of knowing the relative success or failure of the search. The critical feedback necessary to improve practices is missing.

THE PROCESS -- IN A BIBLIOGRAPHIC DATA BASE SETTING

A similar process occurs in the development of a search in a bibliographic data base. Somerville (1977) has provided a sample of an interview for an online search for scientific information which will serve as an example of the process. (Appendix A).

As a general rule, the reference interview for developing an on line bibliographic search usually takes from a half hour to an hour and should include a follow-up interview (Somerville 1977, Carmon 1975). Let us examine the "simplified interview" provided by Somerville. (Appendix A) The user is a doctor who needs references on a particular chemical process involving photosynthesis. The librarian, acting as intermediary with access to computerized data bases, begins by having the user fill out a search request form. The process begins with the librarian/intermediary stating her perception of the problem after reading the request. She makes some preliminary recommendations which may also be thought of as the initial formulation of a

search strategy. These two activities are carried on throughout the initial dialogue and into the actual on-line search.

The librarian and user discuss various aspects of the problem such as important researchers/authors the user knows, identification of acceptable languages, how many retrospective years to search, and expanding or limiting terminology. As the negotiation takes place it is clear that not only are the question and problem being refined, but also both participants are being educated. The user is learning about the data bases and obtaining insight into the question and problem while the intermediary is learning more about the system and the field being researched. The final phase of the interview, Relevance Judgement, began early in the process as the user and the intermediary interacted over such things as the use of terminology, acceptable languages (e.g., French, German), time frame, and the decisions to accept or reject bibliographic items. This phase may extend past the interview, search, and delivery of results to the retrieval of documents (articles, monographs, etc.) and determination of their utility by the user.

THE PROCESS -- IN A DATA PROCESSING SETTING

When a client or user contacts an intermediary of a data processing organization to run a report or to modify or create a system, a process is initiated that appears to be similar to the previous examples. Let us assume that the user is interested in developing a report on demographic data available from that organization. The user might telephone the programmer and discuss the general nature of the report. After a short discussion, they agree to meet to discuss the details.

The meeting takes place in the user's office and begins with the user producing a sketch of the content of the report. The intermediary (programmer or analyst) looks the sketch over and begins to make some notes. A discussion begins that covers such questions as:

1. The availability of all the data elements requested
2. The timeliness and consistency of some of the data
3. The date the report is needed

4. The layout of the report

5. Computations needed

6. How much the report might cost and who will pay for it

After a half hour discussion of these subjects the intermediary leaves to begin working on the program.

After some time the intermediary completes the program and executes a "trial run" on the computer against a small set of the data. Then another meeting is arranged with the user to examine the results of the trial run. At this meeting the user suggests some differences in the layout of the report. Some changes are made in the way the report will look and the computations are checked. After agreeing on the changes the intermediary revises the program and executes another trial run. This test is sent to the user who checks it over and telephones the intermediary giving approval to run the report against the complete set of data. When the complete report comes in, it is sent to the user for his use.

Analysis

This scene contains all the elements of the reference interview. Negotiation of the problem has taken place at several stages, during the first telephone call and during the first and second meetings. As the user began describing

the report over the telephone, the intermediary probably has begun to think about which data sources (sets) would have to be used to generate the report. The process of Question Translation has begun and is found also in the note taking during the first meeting. Also in this meeting the intermediary has begun a subconscious process of developing a strategy for writing the program. This strategy will be checked out and probably modified during the program writing phase of the project. In this example neither the intermediary or the user actually search a data base, but the process of implementing the program might be thought of as the Search Execution stage. The difference in this situation and the online searching of a bibliographic data base is the lack of interaction between a person and the data. A common practice among data processing organizations is to run tests of reports before making a final run. This is especially true where the report is very long or expensive to run. This practice gives the intermediary an excellent opportunity to obtain feedback on the report which is analgous to the Relevance Judgement found in the other examples.

TWO MODELS OF THE PROCESS

Two models which describe the elements and process of "how one person tries to find out what another person wants to know" (Taylor 1968, p.179) are presented. The Taylor model identifies processes for the "prenegotiation decisions by the inquirer", levels of question formulation, and five filters through which a question passes. Taylor's models were derived from a study he conducted while at Lehigh University, Center for Information Science. The Carmon (1975) model identifies five basic elements of the process as observed during several years of study at two bibliographic retrieval sites, the University of Georgia and the University of California, Los Angeles.

THE TAYLOR MODEL

The general objective of Taylor's (1968, p.178) research "was to examine and analyze certain relationships between library systems and library users." Specifically, Taylor wished to address the problem of how libraries can better help patrons in their search for information. He (Taylor 1968, p.178) states:

"We are dealing here of course with a very subtle problem - how one person tries to find out what another person wants to know, when the latter cannot describe his need precisely."

A critical element to this process is a caveat concerning the users inability to "describe his need precisely." When the user has no difficulty with problem description then the need for negotiation is low. Taylor (1968, p. 179) expands on this distinction:

"...an inquiry is looked upon not as a command, as in conventional search strategy, but rather as a description of an area of doubt in which the question is open-ended, negotiable, and dynamic."

This makes question negotiation "one of the most complex acts of human communication" because "one person tries to describe for another person not something he knows, but rather something he does not know."

The Prenegotiation Model

Of interest is Taylor's model for "Prenegotiation Decisions by the Inquirer" (Figure 1) which outlines the basic decisions and steps which lead from the recognition of an information need to the library.

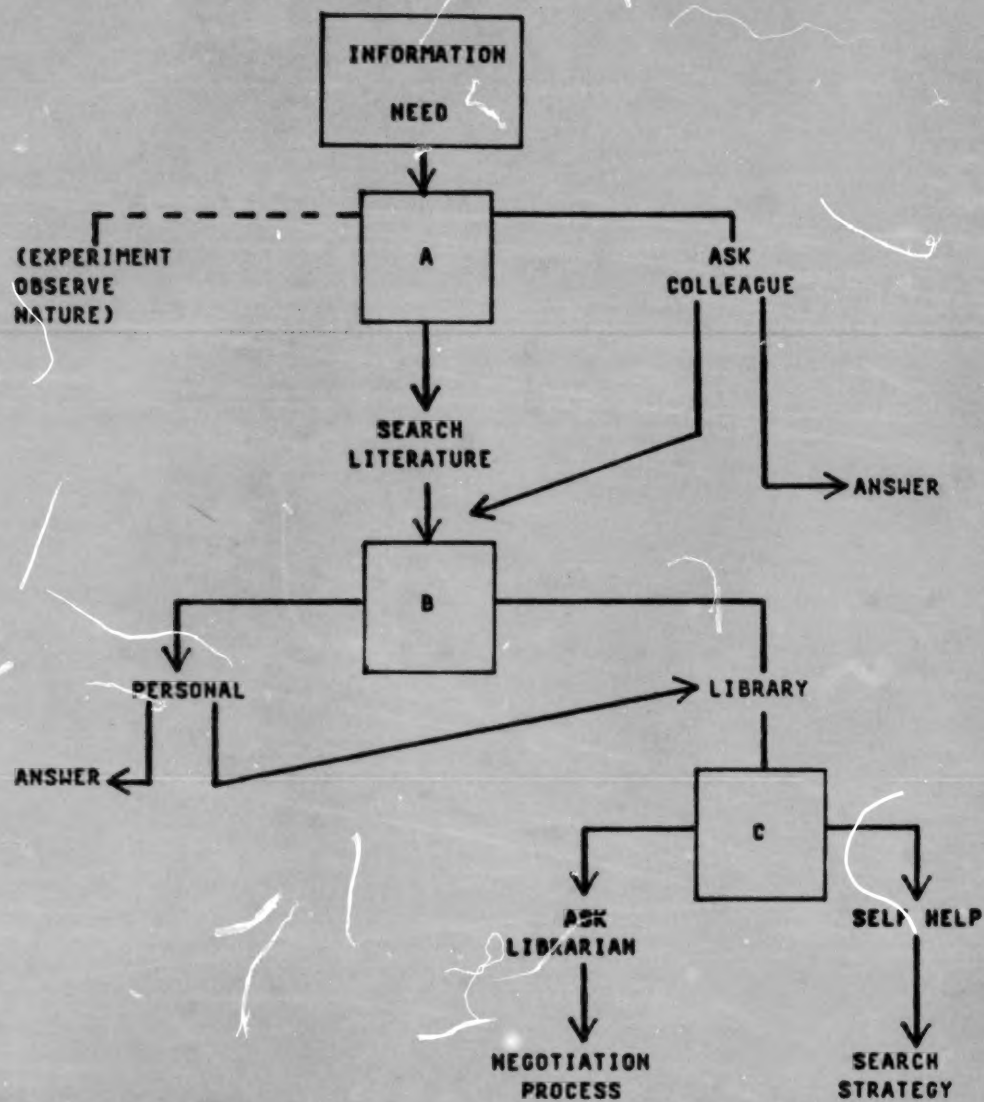


Figure 1. The Prenegotiation Model

Levels of Need

Having arrived at the librarian's information desk the user specifies in some form what it is "he hopes to find out." (Taylor 1968, p.182). For the librarian to better understand the level of sophistication of the question, Taylor presents a second model which describes four levels of information need.

TABLE 3

LEVELS OF NEED

QUESTION LEVEL	NEED	DESCRIPTION
Q1	Visceral need	the actual, but unexpressed need for information
Q2	Conscious need	the conscious, within-brain description of the need.
Q3	Formalized need	the formal statement of the need
Q4	Compromised need	the question as presented to the information system

It is part of the role of a librarian when confronted with a user's need to recognize the level of the user's need. A difficulty arises, however, in that a user is "...inclined to pose his first question in positive and well defined terms (Q4) (Taylor 1968, p. 183)." If the intermediary accepts the statement of the need without probing and the need, as stated, is not really what is wanted, then there is a high probability that the results will be unsatisfactory. Taylor (1968, p. 183) finds that "the skill of the reference librarian is to work with the inquirer back to the formalized need (Q3), possibly even to the conscious need (Q2), and then to translate these needs into a useful search strategy."

1 Question Filter Model

Next Taylor describes "five filters through which a question passes, and from which a librarian selects significant data to aid him in his search." These filters are:

1. Determination of subject
2. Objective and motivation
3. Personal characteristics of the inquirer
4. Relationship of inquiry description to file organization

5. Anticipated or acceptable answers

Subject Determination

The purpose of this activity or filter is to set the basic "limits and structure" (Taylor 1968, p.184) of the subject in question.

Objectives and Motivation

Taylor finds that this filter is probably the most critical to the process and good answers will have a "high payoff in subject definition" (Taylor 1968, p.185). The intermediary often must use tact in exploring why the user needs certain information, what his motivation is, or how the information is to be used. Most of the librarians Taylor interviewed found this to be critical to the success of any negotiation.

Personal Characteristics

Taylor finds that items of interest to the librarian regarding the personal characteristics are:

1. What is his organizational status?
2. Has he been in the library before?
3. What is his background?
4. What relationship does his inquiry have to what he knows?
5. What is his level of critical awareness?

All of these factors contribute to the context in which the search is being conducted and can give the intermediary a sense of the urgency for the search and thereby affect the searching strategies.

Relationship of Inquiry Description to File Organization

This filter underscores the intermediary's role as a translator. The analogy of a chess game is used by Taylor (1968, p.186) to describe this filter. In this game the intermediary has a distinct advantage in that he knows all the rules (the organization, structure, associations and specific peculiarities of the system) and the user does not. Taylor (1968, p.186) notes the implications of this position by stating:

"We redefine the problem to match the search strategy. The implications of such a statement, if taken at face value, can have the effect of redefining librarianship."

Acceptable Answers

What is acceptable and expected from a system, has a profound effect on the user's evaluation of the final results. "When an inquirer approaches the reference desk, he has some picture in mind as to what he expects his answer to look like, i.e. format, data, sized, etc. (Taylor 1968, p.188)." Therefore, the intermediary must get some idea as to what the user expects to see.

THE CARMON MODEL

While stressing the "adaptive, iterative" nature of the reference interview Carmon (1975) identified five basic functions or steps which take place during the reference interview. These are:

1. Question Negotiation
2. Question Translation
3. Strategy Formulation
4. Search Execution
5. Relevance Judgement

Question Negotiation

This first crucial step in the reference interview contains the human interpersonal interactions which are related to the "presentation and clarification of the users question." Carmon found that 57% of question negotiation activities took place during the first quarter of the interview. He stated "the intention is to arrive at a clear narrative, natural language statement of the users information needs and to gather a number of facts and clues used to amplify or

refine this statement" (Carmon 1975, p. 101).

Question Translation

When the intermediary begins to ask questions which attempt to match the question to the available resources, the process of negotiation has begun, concurrently with the process of translation. A process of translation begins within the intermediary which is a test of system and file knowledge and creative communication skills. These are used by the intermediary to draw out the users information needs. In Carmons words (1975, p.102) "information about the users' query gathered in the first step is translated or transformed into the language of the information system."

Strategy Formulation

Having understood and refined the question, and attempted to locate resources to satisfy the user's needs, a design of a plan for retrieving the desired information is developed. In a library setting this might be a simple set of directions to the appropriate references with instructions on how to use them. Strategy Formulation is, however, a more complex process in data base searching. The searcher may have several data bases from which to choose, or may

decide to search more than one, therefore the organization and search terms of each may differ. A different strategy is usually necessary for each data base. Furthermore, the time spent at a terminal conducting the search is costly. In general, the formulation of a strategy for searching data bases is formal and involves expert knowledge of file structures, system command language, searching terminology, and at least some rudimentary knowledge of the subject under study.

1 Search Execution

With the completion of the above steps the intermediary is prepared to conduct the actual search. This process in a bibliographic data base setting will involve the intermediary interacting with the data base via a terminal. Recognizing the dynamic, iterative nature of the process Somerville (1977, p.18) suggests that if possible the inquirer should be with the intermediary at the terminal during the search in order to "develop an understanding of the process... and to help make decisions that most closely match his needs". In other words the user can be an aid in further refining the search while it is underway.

Relevance Judgement

This phase of the interview is important to refinement of the search and the improvement of the system and process. In a sense relevance judgement could be thought of as analogous to feedback. It is the way in which the user lets the intermediary know how well the answer does or does not fit the question. In a subtler way the intermediary also learns of his or her success and skill at conducting a reference interview. Somerville (1977, p.15) terms this step "follow through" and also stresses its importance to building confidence in the intermediary and the system for the user. Carmon (1975, p.101) states:

"there is a continuum ranging from complete satisfaction to complete dissatisfaction. Satisfaction would presumably terminate the reference process as the user walks away with the answer in hand. Anything less than complete satisfaction should theoretically trigger the revisions through cyclic processing for the necessary steps. And if relevance judgements do lead the user to try a revision, the initial set of answers presumably provide insight as to the deficiencies and potential corrections or revisions."

The relationship between these steps appears on the surface to be linear and sequential. This is more a phenomena of language and descriptive techniques than a true rendering of the process as observed. In fact, for the process to work

effectively it is important that it not be linear. The very use of the term negotiation implies a necessary interplay and exchange between user and intermediary. The reference interview is a process of refinement; a refinement of the question and of the intermediaries understanding of that question. Carnon (1975, p.105) concludes his description of the reference interview thusly:

"Although description of the reference process in terms of discrete steps tends to imply a linear sequence of the functions, there is substantial practical experience to suggest that the process is in fact iterative in nature."

OTHER VIEWS OF THE PROBLEM

While it is not the purpose of this thesis to establish a causal connection between the reference interview and overall success of an information system, it is important to understand that a relationship exists between information retrieval and system effectiveness. A number of variables have been identified that appear to affect the utility of an information system. Some of these variables include "failure on the part of top management to ask the right questions" (Diebold 1969), lack of strategic planning (Ein-Dor and Segev 1978), and methods of financing and organizational control (Herzlinger 1977). Altman (1971, p.2) suggests, "The criterion of system effectiveness is the extent to which the system delivers relevant facts and data to its users." Apparently it is not uncommon for "the majority of reports distributed to users" in information systems to be considered "useless and simply ignored by user prsonnel" (Bimmerle and Densmore 1980). The difficulty with this situation in a computer graphics system was recently

reported by Anderson (1980, p.45): "If a client has a graphics problem but they don't effectively communicate what it is they want to do and you don't make the effort to inquire about it and to share a mutual interest in it, then you're never really going to solve the problem to the client's satisfaction." Data base designers are admonished to take into consideration user's needs while building systems (Altman 1971, Lucas 1975). Data base managers are counseled to examine their report layouts and distribution procedures (Bimmerle and Densmore 1980). Within the sphere of bibliographic data base systems searchers are encouraged to develop sound search strategies (Bates 1979) and tactics (Jahoda 1974), to develop new tools (Back 1971), and to define "user" to include the "user sub-system" (Cole 1978).

Others have found that failure of a system to deliver desired results can be attributed to incomplete strategies, inappropriate vocabulary, and failure to explore "all reasonable approaches to the retrieval of relevant articles" (Egeland 1975, p.193). Researchers of on-line searching in bibliographic systems have found that machines will not be able to replace the intermediary in the foreseeable future (Jahoda 1974). Even when end users have direct access to a system, after the newness wears off, they generally prefer to have an intermediary conduct their searches (Egeland 1971). It is estimated that this situation will continue

with 85% of all searches being conducted by an intermediary during or after an interview.

The process of finding out what people want from a system is well known within the field of librarianship. Use of the term "reference question" is found as early as the turn of the century in Rickey (1899) and Mudge (1902). Wyer (1930) identified three factors involved in the interview, the inquirer, the reference librarian, and the source of materials. Hutchins (1944) distinguishes between the reference question, the reference interview, and techniques and methods of answering reference questions. Interestingly, very little attention is given to the problem of judging relevance in this classic text book. This may in part be the result of publication of this work prior to the recognition of feedback as a crucial link in system effectiveness and user satisfaction.

Taylor (1968) provides a useful analysis of the reference interview. He describes the dynamic, open ended nature of question negotiation, identifies four levels of information need, posits the existence of five filters through which a question passes, and among other things, stresses the importance of negotiating the original question to fit the file structures. Katz (1969) is a comprehensive text, which describes not only the elements of the interview, but is in itself an exhaustive review of the library science

literature on reference service. Of particular note is that both Taylor (1968) and Katz (1969) acknowledge the importance of sound communication practices to the reference interview. As the American Society for Information Science Distinguished Lecturer of 1970, John Cuadra remarked, "We do not need technological breakthroughs to exploit the potential of on-line systems." He noted one of the major difficulties to be faced in exploiting that potential: "There is something very personal about information needs, and every translation of those needs from one head into another, or from one language format to another, runs the risk of reducing the fidelity of transmission" (Cuadra 1971, p. 108).

The difficulty with improving the quality and relevance of output seems to lie less in improved technology (hardware and software) than in the human interactions which initiate those outputs. The central human activity which initiates the process of developing computer output is an interview between someone knowledgeable in the system and someone who is not, but wishes to use its capabilities to help solve a problem. This interaction is a human communication process that is not unique to the field of data processing. The process has been recognized for years within the field of librarianship and is known as the reference interview.

1

CHAPTER I I

1

METHODOLOGY

Overview

This study was a descriptive investigation of six (6) organizations that provided some kind of services that involved the use of computers to provide data or information. Organizations were chosen from The Official Directory of Data Processing (1978) and from the researchers knowledge of local organizations. Fifteen organizations were sent letters on September 1, 1981 requesting their participation (see Appendix B). Follow up telephone calls were made during the week of September 8, 1981. Questions about the study were answered and details of the site visits were arranged.

All the organizations were called with the exception of two (one had apparently gone out of business and the other had changed names which was discovered during the second week of visiting sites). Six of the organizations were visited. (Table 4)

TABLE 4
SITES VISITED

<u>Site</u>	<u>Date</u>
California Department of Transportation (CALTRANS)	Sept. 15/16
California Almond Growers Exchange	Sept. 17
University of California, Davis Libraries	Sept. 18
California State Board of Equalization	Sept. 21/22
Systems Data Processing Corporation	Sept. 23/25
California State Library, Administrative, Legislative Reference Library	Sept. 24/25

Data for this study was obtained from several sources. Interviews with managers of the organizations, intermediaries who operate the computer, and the users of the organization's computer services were conducted.

The Interview

Interviews were conducted at each of the sites agreeing to participate in this study. The interviews were face-to-face and followed an open-ended interview schedule. Interviews took approximately one to one and one half hours each.

The Interview Schedule

An open-ended interview schedule was developed, pre-tested, refined, and used to guide the collection of interview data for each of the three types of interviews (see Appendix C).

The Observations

Attempts were made to observe intermediaries and users in the process of developing output requirements at each site. An observation guide was developed and used during these observations. All observations were conducted openly with the knowledge and permission of the participants. The observations were silent and non-participatory.

The Pre-Test

The pre-test was conducted over a period of several months and included simulated interviews, role-playing, and discussion of various methods with practioners.

1. Interviews were conducted with managers, analysts, programmers, and users of the services of the California State Department of Education Applied Systems Unit and Independent Data Processing (IDP).

2. During the pre-test interviews several modifications of the interview schedules were developed and tried. Sample dialogues were developed to test possible responses. Results of the interviews were reviewed with the advisor to this project.

3. Simulated interviews were done with professional colleagues of the researcher and with the advisor. During these sessions the interviewees acted out potential responses from users to the questions being posed.

SPIDOC

SPIDOC is a word processing and text management system designed to provide online documentation for computer

systems at the Stanford University Center for Information Technology. During the early weeks of September 1981 a decision was made to enter the text of this study in SPIDOC. With the exception of the forms contained in Section G of Chapter Three and Appendix D this manuscript was developed and managed using the SPIDOC system.

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CHAPTER I I I

1

RESULTS OF THE INVESTIGATIONS

INTRODUCTION

This chapter provides an analysis and summary of the data collected during visits to the six organizations described in Chapter Two. Chapter Three is divided into eight sections. Sections one through six present descriptions of the interviews and observations conducted at each organization visited. Section seven describes the various forms and user/intermediary aids used by each organization. Section eight presents the summary of findings.

To insure the privacy of the participants in this study individuals names were not recorded. Each participant was identified by a number. For example data collected from the second user at CALTRANS was recorded on the "User Interview Schedule" (Appendix C) as User #2. The same naming convention will be used to describe the data reported in Chapter Three.

CALTRANS

CALTRANS was visited on September 25 and 26 of 1981. This section presents the results of the interviews and observations conducted during the visit. Table 5 summarizes the interviews and observations conducted during the two day visit.

TABLE 5

SUMMARY OF VISIT

ORGANIZATIONAL ROLE	NUMBER OF PERSONS INTERVIEWED
Manager	2
Intermediary	2
User	4
Observations: 1	

CALTRANS is the state agency responsible for California's highways. Until recently the primary mission of CALTRANS was the construction of the California public highway system. With the near completion of that system emphasis has shifted from construction to maintenance. There are approximately 14,000 people employed by CALTRANS in jobs ranging from highway and landscape maintenance crews to engineers and administrators. For administrative control CALTRANS has divided the state into eleven districts. In addition the headquarters for this agency is located in Sacramento and employs approximately 4,000 people. This office houses all the major planning, development, and administrative functions for CALTRANS. (CALTRANS EDP MANUAL, 1981)

The Office of Computer Services

The Office of Computer Services was responsible for "any and all data processing activities" (Manager #1 Interview) within CALTRANS. This included approval authority for the purchase of hardware and software, and the in-house development of systems and programs. Responsibility extended to the operations of all eleven district offices. Nearly all the Office of Computer Services computerized operations were conducted through the Stephen P. Teale Data Center (hereafter referred to as "Teale") which was owned and operated by the State of California. Most of the work

of the Office of Computer Services at Teale was the maintenance of application programs that have been in operation for some time. However, the Office of Computer Services recently implemented a budget preparation system, entitled "BROKER", using the RAMIS II (see Definitions, page 6) data base management system available at Teale. CALTRANS and the Office of Computer Services, like most state agencies, were experiencing the effects of budgetary restraints and inflation. For Fiscal Year 1981-1982 they had budgeted \$8.5 million for data processing activities but had only \$6 million to carry out those activities. Administratively the Office of Computer Services was in the Division of Administrative Services whose chief reported to the Deputy Director for Administration and Finance. This Deputy Director was one of four reporting directly to the Director of Transportation who was a political appointee.

Goals/Objectives and Priorities

A statement of the official goals and objectives of the Office of Computer Services was obtained from two sources; the manager of the Office of Computer Services, and from the CALTRANS EDP Manual (1981). As stated in the CALTRANS EDP Manual (1981, p. 2) the objectives of the Office of Computer Services are;

1. The creation of well designed, fully documented, cost effective and error free systems that meet user needs.
2. To provide a methodology that was consistent with good project management practices.
3. Improved response to users.
4. Assurance of quality products through the formal check points in the process.

In the managers words, "the goal of the Office of Computer Services was to meet the information needs of its users." Priorities for work within the Office of Computer Services were set by agreement among the Deputy Directors and Division Chiefs through the EDP Work Plan Process. For a request for data processing work to be added to the work load, a unit must must have initiated a request for a project. The request was entered onto a list of other projects against which it had to compete for priority. Periodically this list was reviewed by management and new priorities assigned. As projects were completed the list of priorities changed. In the past, the Office of Computer Services manager noted, that Division chiefs had generally "rubber stamped" projects. This was no longer the case. Division chiefs were now looking more closely at the data processing projects and budgets, and using a firmer hand in setting priorities for the Office of Computer Services (Manager #1 Interview).

Intermediary #1 stated that the unit's goals and priorities were to get projects done on time and within the budget, and to provide data processing services to their client units. Intermediary #2 stated the units goals were to design efficient and complete systems. The setting of priorities was understood to be set by management and was seen to be subject to some "politics" and the current work load (Intermediary #2 Interview).

All of the users interviewed were in agreement that the goal of the Office of Computer Services was to provide data processing services to individual units. Specifically the users perceptions of goals for the Office of Computer Services were (1) to provide management and accounting reports, (2) to function as "application" consultants and, (3) to deliver data processing services, projects, and systems.

The Process -- The Intermediary View

Two intermediaries were interviewed at the Office of Computer Services. Both intermediaries were systems analysts in a unit responsible for modifying financial application programs within the Division of Financial Control and Operations. Financial Control and Operations had responsibility for such activities as collecting toll

bridge receipts and tracking the cost for maintenance of CALTRANS equipment and facilities. The work the Financial Control and Operations required from the Office of Computer Services included writing new programs as well as maintenance and update of existing programs. Requests for new programs and modifications were channeled through a unit called the Systems Development Branch. Personnel in the Systems Development Branch who acted as go-betweens for other Financial Control and Operations units and the Office of Computer Services were accountants or auditors who had some training or experience with data processing. The following activities were described as taking place during the process of defining output requirement:

Process Activities

When a request for a job was recieved it was read and commented on in writing by the assigned intermediary. If possible, and if the request was complex enough, the request and comments were discussed with other analysts or programmers familiar with the operation. A meeting was set up between the intermediary and a member of the Systems Development Branch. When possible the analyst attempted to discuss the project with the actual user of the program beforehand. During the first meeting the intermediary attempted to keep the discussion away from details of the

process so as to get a better conceptual idea of the problem (Intermediary #2). This meeting ran about one hour, though it occasionally ran over two hours. A major activity of this meeting was to clear up misunderstandings between the user and the analyst over the nature of the problem (Intermediary #1). In order to effectively clear up misunderstandings a great deal of probing took place. Specifically, the intermediary tried to solicit discussion from the user about such issues as the subject area of the program, what the user wished to achieve, and why the user was requesting the project to be undertaken.

For Intermediary #1 the purpose of this first meeting was not only develop an understanding of what was needed, but also to uncover the logic behind the currently existing system or operation. She felt this was accomplished by first developing a physical orientation to the operation by looking at the forms currently in use and getting a description of the activities (observation was preferred when possible). Then by applying logical analysis to the existing state in combination with the users described need, it was possible to discover where the project was headed. Having determined the project direction the intermediary was in a position to know what kinds of computer products and services were needed.

After the first meeting the analyst went to work on the problem and to map out a strategy for its solution. Analyzing the problem and developing a solution entailed discussion with other programmers and analysts familiar with the operation and applying systems analysis and design tools. Depending on the complexity of the project, another meeting may be arranged between the analyst and intermediary to clarify the details. If the problem was sufficiently complex a formal meeting was called. Otherwise the analyst and intermediary met frequently and informally after the first meeting until the project was completed. As part of normal administrative procedures, analysts in each unit made monthly progress reports to the supervisor. Information on communication skills necessary to successfully find out what users need was solicited from the intermediaries. A summary of those skills follows:

1. To clear up misunderstanding it was critical to be honest. "It was necessary to have confidence and be good at the job." (Intermediary #1 interview)
2. Try to understand the users level of confidence with their work and the computer.
3. Be aware of the users organizational role.
4. Try to keep the interaction "one-on-one."
5. Try not to be defensive or put the user on the defensive.
6. Be aware of other outside influences on the user;

"Cut through the noise." (Intermediary # 2 interview)

7. Be sensitive to the user's possible embarrassment if a misunderstanding was uncovered.
8. Let the user know that their need had been heard and was being considered.
9. Always try to meet on the users ground.

The intermediaries observed some communication difficulties that needed to be overcome during the process. Intermediary #1 noted that users became frustrated with the analysts' need to understand seemingly minute details of what is a well understood process for the user. Intermediary #2 noted that often a user approached a problem with the computer solution already in mind, which made arriving at the best solution difficult. Two related problems were identified which affect the definition of problems and requirements between users and intermediaries; personnel turnover and documentation. These problems were particularly important when a program was being modified or a new program was to be written based on an older existing program.

Documentation

Because of frequent turnover in programmer personnel it was common for an intermediary to be responsible for modifying a program that was written several years ago. Furthermore, the person who wrote the original program was probably no

longer employed with CALTRANS, and there was no narrative description (documentation) that described the program. In order to modify the program the current intermediary had to analyze the program instructions to determine what happened when the program was run, discuss his analysis of the program with other programming personnel, and get the user (if available) to recall the reasons for the program. This use of time and effort by the intermediary and user was recognized as inefficient by the Office of Computer Systems. I was not able to determine what steps, if any, were being taken to address this problem.

Personnel

A high turnover rate in data processing personnel is an industry wide problem (Cherlin 1981), attributed in part to an industry shortage of trained computer programmers. Their services are at a premium programmers' can demand and get higher salaries and move from job to job to increase their earnings. The Office of Computer Services feels the effect of the problem in frequent turnover of programmers (Mangaer #1). Most of the programmers at CALTRANS have been employed there less than two years (Manager #1).

The Process -- The User View

Because of the diversity of application each user of the Office of Computer Services services brought a different perspective to the process. What follows is a summary of each user's perspective.

User #1

The first user interviewed was an auditor with the Systems Development Branch whose role was to act as an intermediary between units within Financial Operations and Control of Financial Operations and Control and the Office of Computer Services. User #1's job was to insure that requests for data processing services submitted by units in Financial Operations and Control were completed to the satisfaction of the requesting unit. The process of defining requirements between the Office of Computer Services and the Systems Development Branch was as follows:

1. An idea for a system or change was written up by Financial Operations and Control and shared with an auditor in the Systems Development Branch.

2. A form for initiating the system or change was put into an administrative process used to set priorities
3. After approvals within Financial Operations and Control were obtained specifications were written by the Systems Development Branch. At this time a Systems Development Branch auditor would "nose around" (User #1 Interview) informally at the Office of Computer Services to find out as much as possible about the operation.
4. The Office of Computer Services assigned an intermediary to the project upon receipt of the form requesting the work.
5. A meeting was arranged between the intermediary and the auditor. This first meeting was a general discussion meeting intended to "break the ice" (Intermediary #2 Interview) and define the problem in general terms.
6. After this meeting both parties gave the problem some thought and then meet again.
7. The second meeting began the process of writing specifications for the program that would be written or modified. During this phase the intermediary the auditor, and any programmers assigned to the project, might meet daily to work out problems. The programmer was responsible for translating the computer specifications into a program. There was high interaction between all the parties involved during this phase (Intermediary #1 Interview).
8. When the program was written, test runs were conducted, "dummy" reports were run and reviewed, and when appropriate, parallel runs were made with the existing program.
9. When the user was satisfied that the new programs would work as needed it was "signed off" as complete and turned over to the Data Control Unit for regular operation.

1 User #2

This user was an engineer/supervisor who recounted a five year project to develop a "Pavement Management System". The purpose of the project was to develop methods for collecting, coding, and entering data into a computer on the conditions of the pavement on all of California's public highways. This project identified information needed by CALTRANS management to make decisions for assigning priorities and resources for highway repairs. Computer reports were designed to provide the information needed by CALTRANS management to allocate resources for the upkeep of the state's public highways. Following the design and development activities the "Pavement Management System" was tested and implemented. It was currently in operation at CALTRANS.

The user felt that a major factor contributing to the success of this project was the intimate involvement of the intermediary from the very beginning. The intermediary was assigned full time to the project and operated for the most part from the user's office. In this particular case the intermediary also had some understanding of engineering which was helpful. The user felt that to get the most out

of the computer the intermediary had to know the problem intimately and should, therefore, be assigned to the unit. The user also felt that for many data processing people working in units was the most exciting and creative type of data processing work. However, he also noted a dilemma for the intermediary. While the work was exciting and challenging the intermediary was removed from the mainstream of his/her field.

1
User #3

This user had responsibility for managing a data base system used in support of the Budget Development Unit. This responsibility included managing the technical operation of the data base and meeting the information needs of the Budget Development Unit as well. To find out what kinds of information were needed by Budget personnel, User #3 identified the following steps as necessary:

1. Collect data about the problem in general terms. He commented that at this stage the user does not really know what he wants. "Frequently, we will both not know what was wanted until we have something on paper to respond to."
2. After the first meeting to get a general idea of the problem he "mashes" it around and sets up a meeting with an intermediary from the Office of Computer Services.
3. If the need is still unclear after meeting with the

Office of Computer Services intermediary then the user and intermediary will both meet with the end user.

4. Draft reports are then drawn up and negotiated with the user.
5. Finally the data sources and output requirements are identified.

1 User #4

User #4 was the supervisor of the Data Collection and Testing Unit. This unit had responsibility for checking out new or modified financial reports as they went through various CALTRANS accounting systems prior to acceptance by Financial Operations and Control of Financial Operations and Control. User #4 was the individual responsible for verifying that changes made by the Office of Computer Systems to the CALTRANS accounting system functioned properly. If problems were discovered during the test process then User #4 would work with the intermediary and the user to make the changes necessary for the program to work correctly. The users self-description of her role was that of "referee" and facilitator. In that role User #4 said that communication was important to the success of her efforts to facilitate. She further commented that very few of the intermediaries knew much about the CALTRANS accounting system. This was partly due to their lack of

experience. She also commented that probing the users about their needs was important to the process of getting the programs to work. She noted that without probing "nothing will get done right later" (User #4 Interview).

Observation -- September 16, 1981; 1:15 -- 2:15 PM

Participants:

Intermediary #2 -Office of Computer Services
User #1 -- Systems Development Branch

One observation was made of an interaction between an intermediary and a user at CALTRANS. A user from the Systems Development Branch requested a meeting with an intermediary from the Office of Computer Services. The subject of this meeting was the development of a computer program that would keep track of CALTRANS receipts from bridge tolls. This program would replace an existing program. The writing and implementation of this program was originally assigned to another intermediary and for reasons not stated had been delayed. Intermediary #2 had recently been assigned to manage the project of developing this program. The purpose of the meeting was to familiarize the intermediary with the project and to bring him up to date on its progress.

The meeting lasted approximately one hour and could be characterized as an extensive description of current system performance, from both the user's and analyst's point of view, and its relationship to the current project. There was a considerable amount of probing by the intermediary especially in the area of "why" a particular approach was desired. There appeared to be some tension between the two parties. Interviews with the participants after the observation revealed that both had some "hidden agendas." The analyst noted that he felt the Systems Development Branch was an impediment to the process of finding out the user's needs and its role should be eliminated. The intermediary also noted that often users came to meetings with a solution already in mind which further hindered the process. In the later interview User #1 remarked that the delays experienced in the "data processing shop" (the Office of Computer Services) would not be tolerated in his unit. These attitudes about each others unit helped explain why neither party appeared to be listening to the other very well.

Summary

There was a high degree of probing by the intermediary (to the point of antagonizing the intermediary), low negotiation, and a low degree of discussion or sharing of objectives. The parties did attempt to find some mutual grounds for agreement near the end as they searched for closure and agreed to meet again.

Shared Knowledge -- The Intermediary View

Both the intermediaries and the manager of the Office of Computer Services thought it was important for data processing personnel to know more about the users operations. The intermediaries both worked with developing financial systems and found it helpful to know in principle how accounting reports work. Both intermediaries felt the Systems Development Branch was a hinderance because it put a non-systems analyst in the position of negotiating a system for which he/she was not a user. The intermediaries said it would be helpful if the users understood how data processing works, and the fundamentals of problem solving.

1 Shared Knowledge -- The User View

All the users interviewed at CALTRANS had considerable experience with data processing and one had college level education in computer languages. User #1 had had limited job experience with computers but had extensive college level and agency sponsored training in BASIC, COBOL, FORTRAN, and MARK IV computing languages. User #2 had been involved with computers at CALTRANS since their introduction in the early 1950's and clearly understood their capabilities and limitations. User #3 was functioning as a data base administrator and had extensive computer system design experience with another state agency. User #4 had performed the job of testing fiscal systems for nearly 18 years where she gained all her data processing experience.

1 Evaluation/Feedback --The User View

Ratings of the quality of the services delivered by the Office of Computer Services varied. User #1 was very satisfied with the engineering computations provided by the the Office of Computer Services. However, regarding the development of computer systems he felt "there has to be a

better way". User #2 rated the services provided as adequate. He noted that since he and some members of the Office of Computer Services were learning how to use the RAMIS II system together the intermediaries weren't much help to his operation. Users #1 and #3 responded that if reports were not done right they kept sending them back until they were.

All the users agreed that the Office of Computer Services could improve its timeliness. They noted that routine problems have a quick turnaround, whereas other problems had "unreasonable" turn around times and deadlines were not met often enough. (User #3 was repeatedly urged to move from one system to another. He delayed nearly eight months, finally moved and found the Office of Computer Services was not prepared to provide support for the new system.) Some delays were mutually caused. User #2 noted that "data processing types" were notorious for underestimating the amount of time needed to complete a project. It was felt this was because users react negatively to realistic estimates therefore, unrealistic estimates were made ultimately making data processing look bad.

There was general agreement that the Office of Computer Services provided reports that were complete. They also found the intermediaries were cooperative about meeting

users needs for completeness. User #2 remarked that he had never seen a report which completely satisfied all of the user's information needs. This was, however, not the fault of the intermediary but resulted from changes in the user's information needs.

The users unanimously agreed that the question of accuracy was a user problem in that each user was responsible for his data. User #1 did note that random checks for accuracy were done on data but few errors have been found.

Users agreed that during the process of developing a report or system, feedback was transmitted through frequent meetings and telephone calls. Rarely was feedback transmitted in a formal way such as a letter or memo and only with large project.

The Intermediary View

Feedback to intermediaries comes in a variety of ways both formal and informal. Some methods of feedback noted by the Office of Computer Services intermediaries were letters of commendation, feedback through meetings and phone calls, requests for changes after a system was in operation, and an official system of "post-implementation review." Both managers noted, however, that this formal system, which includes a written evaluation by the Office of Computer

Services was rarely used because the intermediaries move on to other projects.

CALIFORNIA ALMOND GROWERS EXCHANGE

The California Almond Growers Exchange was visited on September 17, 1981. This section presents the results of the interviews and observations conducted during the visit. Table 6 summarizes the interviews and observations conducted during the visit.

TABLE 6
SUMMARY OF VISIT

ORGANIZATIONAL ROLE	NUMBER OF PERSONS INTERVIEWED
Manager	2
Intermediary	2
User	2
Observations: 0	

The California Almond Growers Exchange, known by its employees as "The Exchange" is a grower owned cooperative of over 5,000 members. By agreement members were obligated to ship all their almonds to the The Exchange which was in turn obligated to accept them. The 1981 California harvest was estimated to be a record 450 million shelled pounds of almonds (Manager #1 Interview). The Sacramento plant processed half of that crop of 225 million shelled pounds (Manager #1 Interview). The Exchange processed, packaged, and marketed the almonds. Profits were returned to the growers after a percentage was withheld for operating expenses. To gain greater control over their profits the Exchange recently moved into the marketing and sales areas. In the past the Exchange only sold almonds to food brokers which made their profits very susceptible to market fluctuations. By developing a mail order business and opening seven retail outlets, The Exchange was somewhat insulated from market fluctuations. Delivery of almonds from grower to the plant was from mid-August through December with 90% of the harvest coming in September and October. The Exchange shells and processes the almonds, including slicing, dicing, sizing, grading, treating, seasoning, etc.. There were approximately 2,900 employees at the Sacramento plant. Two other facilities, located in Fresno and in Oregon also process almonds. In a normal year nearly half the almond harvest is sold overseas. Last

year's crop failure in Europe caused an increase in overseas sales to nearly 75% of the harvest. Principal foreign markets were Japan and western Europe.

The Unit -- Data Processing

Data Processing had 27 employees who provided services to all departments of The Exchange as needed and directed. Of the 27 employees three were managers (two also function as intermediaries) and one was a systems analyst functioning as a full-time intermediary. The remaining 23 were programmers, key entry personnel, and computer operators. Data Processing served principally the Payroll, Accounting, General Ledger, Accounts Payable, Contract Services, and Marketing departments. In addition they provided support to the retail outlets and mail order department. Intermediary #1 recently completed a five year project to design a data base management system to meet the growing and future information needs of the Exchange. This new system will significantly alter the way users interact with intermediaries. They will have greater access to the information they need without going through an intermediary (Intermediary #1 interview). Currently Data Processing operates over 100 video display terminals throughout the plant and administration operations.

The primary goal of Data Processing was to support the corporate goals which were to serve the grower by providing the most service to the grower and the industry for the least amount of money. Another goal of Data Processing was to maintain technical abilities through training. Long range operational goals were set by The Exchange management at an annual off-site management meeting. The head of Data Processing attended these meetings and was a part of these discussions. Priorities for most projects were set by the Data Processing manager where there was a disagreement over a project status it was referred to a Data Guidance Committee made up of the President, eight Vice Presidents, and the Data Processing Manager. This committee meets two or three times a year.

The Process -- The Intermediary View

Requests for reports or systems were received by the Data Processing manager and then forwarded to the Programming Manager who was in charge of the Applications and Systems Group. If no analysis had been done the manager would analyze the problem or assign the task to the systems analyst to analyze. The request was read over and notes made. It was given to a lead programmer who also read it

over and made notes. The programmer and analyst then met and came up with a list of implications from the form implementing the request. This list of implications became the agenda for a meeting between the analyst, programmer, and the user. If the implementation of the request affected any other users they were invited to attend this meeting. The first order of business was to bring the user up to date on the status of the request. More often than not, few questions were answered at this meeting. If this was the case, then the user and the intermediary discussed what was needed from the user. After the first meeting the user would attempt to get the answers to questions posed by the intermediary. Both intermediaries noted the number of meetings required to complete a project was primarily due to its scope and complexity.

After outstanding issues were settled the design phase ended and the programming began. Periodic status meetings were held to keep the user apprised of the progress. Both intermediaries stressed the importance of keeping data processing jargon out of the conversations about the project. Intermediary #1 stressed the importance of trying to keep the issues and problems on the surface by keeping things from becoming too abstract. Written procedures for defining users information needs consisted of a one page description of activities that should be included (see Forms

Analysis Section). Intermediaries at the Exchange had a one page form used to record data about user's specifications for a job (see Forms Analysis).

The Process -- The User View

User #1 was the Internal Auditor for the Exchange and User #2 was the Corporate Controller. Both users had extensive previous interaction with Intermediary #1 about the development of the data base management system. User #2 had also participated with the Manager in the original research that led to the choice of a data base management system.

Six years ago the Manager and User #2 interviewed the heads of departments within the exchange to determine their information needs. What they determined was a need for greater communication among departments. The computer solution they arrived at was a data base management system. Previously, each department maintained its own set of data files. For example the Sales department would have a file of its customers. The customer records contained address data, date of sales, and a history of past sales. The Shipping department would also have a set of files with data on its customers. Shipping data would also contain addresses, date of shipment, and a history of past shipments. Three important facts emerged from the needs

analysis done by the Manager and User #2. One, many departments were maintaining a large number of duplicate records on the same customer. Two, each department files on a customer was not a single file but a cluster of files. For example, the data of sales data was maintained as a separate file, and the history of sales data was another file. Three, this duplication of records was occurring between many departments. The Exchange settled on a data base management system because it provided a system for maintaining data needed by each department on one record. Each department could see not only the data it used, but also the data about the customer used by other departments. The data base management system would reduce the number of duplicate records and data while making data about the Exchanges' customers available throughout the organization.

The manager stated that since this was harvest time all of the Data Processing activities were focused on operating the plant. He further stated that as a result no computer system or program development activities were taking place. Therefore no observations were possible.

1 Shared Knowledge -- The Intermediary View

Both intermediaries have been with The Exchange for a long time (13 and 14 years) and felt they knew their clients' operations well. The problem was with new people who didn't have the benefit of the experience. In order to learn what was going on (which both intermediaries felt was important) good on-the-job training and supervision were required. One intermediary noted the importance of the users becoming better oriented to capabilities of data processing. He felt that more knowledge on the users part would help a lot. He saw increased "computer literacy" in the schools as an important contributing factor. He posed the question for The Exchange, "Does Data Processing take the initiative in raising the conscious of users to Data Processing's potential?"

1 Shared Knowledge -- The User View

The users both had considerable experience with data processing by virtue of their work in accounting and auditing. They both felt this knowledge was indispensable to their jobs. Regarding the necessity for Data Processing

personnel to know their business both felt it was very helpful. One commented that "a major problem was communication between data processing and accounting". Both also felt that overall Data Processing was doing an excellent job.

Evaluation -- The User View

Overall the services provided by Data Processing were rated as very good. The criteria for quality and excellence set by management and Data Processing more than met their needs and expectations (User #2 interview). The users commented that the personnel in Data Processing delivered what was promised and produced reports with high relevance. Data Processing's success was attributed to (1) a very professional staff, (2) to good controls, and (3) to the intermediaries ability to work together with the users from the beginning of projects to the end. The consensus was that products and services were delivered on time and everything that was asked for was in the reports.

The only problem encountered was that occasionally, the user didn't know what he wanted and the analyst hadn't "teased" it out.

The users agreed that accuray " was what computers do best (User #2 interview)."

Evaluation -- The Data Processing View

While there was no formal system for feedback it was apparently taking place, at least to the intermediaries satisfaction. Both intermediaries do a lot of talking with their users. They rely heavily on social interaction to judge user satisfaction. Normally the Data Processing people wouldn't know how well something was working unless they asked the users. There was no formal sign off procedure or post implementation review. The presumption was that if there were problems the user will let Data Processing know. The Data Processing manager noted that he had no difficulty getting criticism from dissatisfied users.

THE UNIVERSITY OF CALIFORNIA, DAVIS

The University of California was visited on September 18, 1981. This section presents the results of the interviews and observations conducted during that visit. Table 7 summarizes the interviews and observations conducted during the visit.

TABLE 7
SUMMARY OF VISIT

ORGANIZATIONAL ROLE	NUMBER OF PERSONS INTERVIEWED
Manager	1
Intermediary	3
User	1
Observations: 2	

As a member of the state-wide university system, the University of California at Davis, has two main functions; research and teaching. The University library system exists

to support these goals by providing instruction, materials support, reference service, and organization of library materials. The student population ranges between 16,000 and 17,000 students of which approximately 2,000 were graduate students. The academic faculty number about 1400 teaching and 400 non-teaching persons.

1 The Unit -- Davis On-Line Retrieval Service

There were eight intermediaries spread out among seven special libraries who provided services as intermediaries to commercial on-line bibliographic retrieval data bases. Each on-line searcher was a librarian working in a special library and trained primarily in the data bases appropriate to the libraries specialty (e.g., the Biology/Agriculture Library searchers dealt primarily with biological and chemical data bases such as Chemical Abstracts (CA Search). The intermediaries belonged to a loosely structured University recognized committee called the Davis On-Line Retrieval Services Committee. This committee provided the organizational link between the intermediaries in matters relating to computer use. The Committee chairperson acted as the coordinator of University on-line searching activities. This was, however, an unpaid elective position.

Originally Davis On-Line Retrieval Service Committee was formed to help on-line searchers share their experiences and knowledge. The committee has evolved into a quasi-administrative group concerned with developing public information materials and formalizing procedures.

Each intermediary was responsible for serving the information needs of the academic departments using the respective special libraries. For example, the Veterinary Science Department used the Biology/Agriculture Library while the Education department used the Humanities/Social Science Library. Each on-line searcher had access to the services of DIALOG, ORBIT, and BRS the three largest commercial vendors of bibliographic data bases (see Definitions, Chapter One). A variety of hardware was available for searching ranging from low-speed (300 baud) line printers to high speed (1200 baud) printers and CRT's. On-line searching at Davis was done on a fee basis and the user was charged by the minute during "hook-up" to the computer and for the number of citations and/or abstracts retrieved. Prices ranged from \$.35 to \$1.67 per minute of computer access time and 2.5 cents to 25 cents per citation.

There was general agreement among the intermediaries that their goals were to provide reference service. Additional

goals included control of documents and to "mainstream" them and maintain current collections of relevant materials (Intermediary #1 interview)

1 Procedures

Formal procedures for developing information needs were found in the three libraries visited. Each had a one page form for recording accounting data and the terms to be searched. Several handouts were available for users which explained various aspects of on-line bibliographic retrieval. (see Forms Analysis, page --). The procedure for determining if an on-line search was needed was the same for each intermediary.

The user was screened at the reference desk to determine his information need. If the librarian at the desk thought an on-line search might be appropriate then the user was given the "Automated Information Retrieval Services" brochure (see Forms Analysis, page --). After reading the brochure the intermediary and user met. The intermediary questioned the user about his problem to determine how best to approach it. The basic approaches to meeting the user's information needs were to (1) to recommend an on-line search, (2) direct the user to an appropriate reference available on the library's shelves, or (3) direct the user to both library

and on-line services.

At this point in the process procedures vary between special libraries. Some of the intermediaries move immediately to searching while others requested the patron to make an appointment for a search and to compile a list of search terms in the interim. Some intermediaries preferred that the user be present during the search in which case the research question was negotiated during the search session. Those intermediaries who searched alone attempted to sort out the question prior to going on-line. After a search had been completed the results were usually printed off-line at the computer site and mailed to the library. The patron was notified and requested to pick them up. In most cases the results were reviewed by the intermediary and the patron to insure they were understood and were satisfactory.

The Process -- The Intermediary View

The process of finding out what users or patrons needed to know was recognized as crucial to the success of the search by all the intermediaries. This was especially true in a library situation because librarians could not possibly be knowledgeable in all the subject areas they were asked to search. The intermediaries agreed that several items were important and needed to be covered in each initial

interview. These were:

1. Check that the subject matter was covered by the special library
2. Get a list of several search terms
3. Determine if a comprehensive search was needed
4. Try to find out for what use the results were intended
5. Determine what time frame was to be searched
6. Determine the languages which were acceptable
7. See if the user could identify a relevant manual resource (e.g., Psychological Abstracts or Chemical Abstracts) which could be matched with an Automated data base (e.g. Psych INFO or CA Search)
9. Discuss the costs of searching
10. Determine if the patron was new at on-line searching
11. Determine any important authors to include in the search

User #2 and #3 indicated that they spent at least some time explaining about other library services and how the process of searching works, while User #3 indicated she was new at on-line searching and not yet comfortable in trying to explain the "how" to patrons. As a general rule the intermediaries met with a patron twice to cover a particular question. The meetings ran from 10 minutes to about an hour.

The Process -- The User View

The one user interviewed was an experienced scientist with extensive background in both computer hardware and software design. The user was interviewed immediately after observation of an online session and most of his remarks about the process were evaluative rather than descriptive. His comments were summarized thusly:

1. The intermediary did a good job considering his limited knowledge of the subject area
2. The search was relevant but incomplete
3. He did not "trust" the results. He did not feel that all the relevant literature had been touched
5. Because the computer cannot read contexts, people must know exactly what they want in order for the system to be "successful"
6. Ultimately research into the basis of reasoning and thinking was needed to improve these systems

Observations

Observations of question negotiation and on-line activities were conducted on two occasions. Both sessions were in the Biology/Agriculture Library area reserved for such activities and were conducted by the same intermediary.

Observations: September 15, 1981; 2:00-3:10 PM

Participants:

Intermediary (not interviewed)
User #1 (not interviewed)

The user was a biochemist interested in isotope research. User #1 had been screened at the reference desk the preceding day and given the information brochure to read. An appointment had been made by the reference librarian for the participants to meet.

The intermediary began the session by asking if the user had read the brochure. The user replied in the affirmative. The intermediary moved directly to questions about the search terms. Terms were noted on the "AIRS Computer

Search" form (see Forms Analysis Section). The user was French and spoke Russian. He indicated he would accept articles in French and Russian as well as English. The intermediary determined that only citations from the previous ten years need be searched. The user indicated that Chemical Abstracts (CA Search) was the most likely data base to have relevant journal articles, thus, agreed to begin the search there.

The intermediary conducted a preliminary search and explained the results to the user. The intermediary used a "Blue Sheet" as an aid for explaining the results and how CA Search was structured. "Blue Sheets" were two page summaries provided by Lockheed Information Systems to describe some of the bibliographic data bases operated by DIALOG. The "Blue Sheet" contained some information on the structure of each data base, the allowable terminology, and costs of searching.

The review of the preliminary results were used by the intermediary to clarify what the user needed and to improve the search results. The intermediary noted that it was quite a bit more expensive to have the computer print abstracts than citations. Reviewing the preliminary results consisted mainly of the user and intermediary refining the terms for searching to find the ones that seemed most appropriate. Following the first review the intermediary

continued the search. The intermediary would type a search term on the display terminal and a result would appear. For example:

Intermediary typed - chlorophyl

DIALOG responded - Result = 2,872 articles

During this period of searching the user appeared to become tense. Though the intermediary discussed the results with him the user's tension appeared to increase. Apparently, the user's tension was about the cost of the search. The intermediary had explained about the difference between citation and abstract costs, but the total cost for the search was not explained carefully. On several occasions the user asked about the cost and elected to get citations. Furthermore, the user was visibly relieved to find that the search cost was under \$30.

The user also noted that he did not expect to find everything he wanted. When the user was satisfied that the search result would meet his needs the search was terminated. The citations were printed at Lockheed in Palo Alto and were mailed to the University. The user was instructed where and when to pick them up.

The researcher was unable to interview User #1 due to his class schedule and my limited time at the University.

1 Observation #2, September , 1981; 3:30-4:30 PM

Particiapants:

Intermediary (not interviewed)

User #2

The user was a bio-physicist completing a doctoral dissertation on the optical properties of muscle contraction in cells. The first few minutes of the session were spent with the user explaining his project and the need for the search. The user also noted that he had had considerable experience with computers. Because he understood their limitations, he did not expect to find everything he wanted.

After the brief explanation of the user's project and background the intermediary began asking questions about the terms that described the user's needs. The intermediary pressed the user during the initial stages of the session for more information about why the search was being conducted. After some probing the user revealed that he was about to complete research on a new theory and wished to know what other researchers were doing. While probing for the reason for the search the intermediary continued to negotiate the terms to be searched. These negotiations continued throughout the session. This user was an active

participant in the search. Each time a result would appear the user would check it over and discuss its implications with the intermediary.

Questions about costs were raised by the user. Though User #2 had a higher limit on his search (\$50) he was also concerned about having the search cost too much. Because of the greater cost of abstracts, and the users knowledge of the field, he chose to have just citations printed. The output the user would like to have had was unavailable on the DIALOG system. The user wanted to look at the citations and then choose which abstracts he needed. The DIALOG system allowed the printout to be only citations or abstracts; not both.

The policies for charging were not explained very well (in both sessions). In view of the concern both users expressed regarding costs, the charges should have been explained in detail, not just an estimate given. It would have been helpful to interrupt the sessions periodically and give the user some indication of incurred cost. Also a chart detailing the approximate cost of certain quantities of printouts could be available for quick reference by both the user and the intermediary.

Shared Knowledge -- Intermediaries View

For Intermediary #2 and #3 having a knowledge of the user's subject area was not critical to be successful at searching. Both of these intermediaries, however, dealt primarily with non-scientific areas (Government Publications and Humanities/Social Sciences). The intermediary for the Biology/Agriculture library found her background in Veterinary Science very helpful. She noted that her science background made it possible to listen intelligently and that sometimes her lack of knowledge in a certain area hindered the search. With regard to users knowing about the available systems, the intermediaries felt that more knowledge would be helpful. They provided some education about system functions to users where needed and desired. (It was noted that some users "could care less about 'how'; they just wanted their citations. These were also the users who complained the most about the quality of results" [intermediary #2]). All the intermediaries indicated they spent some time reviewing the "blue sheets" or thesarus' for data base when available. This served not only to educate the user about the system but also bolstered and modified the natural language list of search terms.

Shared Knowledge -- The Users View

The user was aware that the intermediary did not share his level of interest or knowledge in the subject in question. He did not expect the intermediary to possess a high level of knowledge, although, he felt it would be helpful. At the beginning of the interview User #2 asked the intermediary about the feasibility of obtaining his own DIALOG account to do his own searching. After the search he revealed that he considered doing this to insure that he would get all the relevant articles (a comprehensive search was required). He felt that the intermediary's lack of knowledge of his area and his lack of knowledge about the data base were two of the main obstacles to a successful search. However, he decided it was not worth his effort at this time to learn how to search the system, so he continued to use the intermediary. The user intended to bolster the results of his search with his knowledge of the file, its journals, and the manual reference sources available on the shelves.

Evaluations -- Users View

User #2 felt strongly that all the relevant literature had not been searched. This evaluation was arrived at partly from his knowledge of the subject area, his expectations of what the results would be, and his knowledge of computer limitations and capabilities. Because of the user's desire for a comprehensive search and the problem of communicating exactly what his information needs were, he found the practice of participating in the search helpful. The user did not trust the results completely and felt "the only way it (the bibliographic data base system) can be useful was when people know what they want."

Evaluation/Feedback -- The Intermediaries Views

There were two ways that the intermediaries found out how effectively their work met their user's information needs. One way was through the dialogue during the sessions and the second came from a review of the results with the user. Because the intermediary often was not fluent in the technical language of the user probing and negotiation were important elements of the process. Iterative dialogue

appeared to be a very valuable feedback technique and had a significant impact on the outcome of searches. By having the user produce a list of search terms, asking questions about those terms, referring to the thesarus or "blue sheets", and continually striving for agreement or disagreement (as opposed to silence or acquiescence to the intermediary's knowledge) the intermediary can exert a significant impact on helping the user to not only better understand what it was that was wanted, but also to insure that the results retrieved match the problem. Without this interplay the search would suffer.

Cost

Since users must pay for their searches and costs were accrued by the minute and the type of output, cost became a factor in searching and user satisfaction. Furthermore, the question of costs was raised in the midst of both sessions observed. For some of the intermediaries cost was a factor in having the user present during the search. As one intermediary reasoned, "The user's paying for it and has a right to be there."

STATE BOARD OF EQUALIZATION

The State Board of Equalization was visited on September 21 and 22, 1981. This section presents the results of the interviews and observations conducted during the visit. Table 8 summarizes the interviews and observations conducted during the two day visit.

TABLE 8
SUMMARY OF VISIT

ORGANIZATIONAL ROLE	NUMBER OF PERSONS INTERVIEWED
Manager	2
Intermediary	2
User	4
Observations: 0	

The California State Board of Equalization is a constitutionally mandated organization governed by a five member Board of Directors. The Directors are elected

officials. Each Director represents one of the four tax districts in the state. The fifth Director is the State Controller.

This agency, known to its employees as simply "The Board" was created because of unequal taxation of property between various California counties hence the term "Equalization" in its name. The Board is responsible for not only insuring equal tax rates across county lines, but also for collecting nearly all state tax revenues as well. Three general categories of taxes are collected with an organizational division representing each. They are property, business, and excise taxes. The goals of the Board, though not spelled out formally, were to collect taxes at the least possible cost to the taxpayer, and "provide the best possible service to the tax paying public" (Manger #1 interview). The 2700 people employed by the Board were located in 20 field offices.

The Unit -- The Data Processing Division

There are approximately 160 people employed in the Data Processing Division. Programmers and analysts (intermediaries) number 30-40 of the Divisions staff with the remainder involved in the technical operation of the computer, entering tax collection data, and clerical support

activities. The Data Processing Division operates its own computer. Since their present UNIVAC computer was no longer adequate for their needs, a conversion was being carried on simultaneously with the introduction of a newer, larger UNIVAC computer. The Data Processing Division supports a statewide network of 115 video display terminals used by the Business Tax Division. This system experiences a 12% to 15% expansion each year (Manager #1 interview). There was no data base management system (DBMS) system in operation nor did the Board have any plans to implement one. Many of the application programs and operating procedures were written many years ago. The Data Processing Division expended a large part of their resources doing "patchwork" on these systems. The primary programming language in use was COBOL. MARK IV and FORTRAN computing languages were also occasionally used.

Goals -- The Data Processing View

None of the people interviewed were aware of any formally written goal for the State Board of Equalization/Data Processing Division. The goals were thought to center around a "classical" definition of what a data processing service organization should do; that was to provide services to their users as required in a timely and accurate manner.

Other goals mentioned were:

1. provide reliable quality service
2. improve operations
3. "make sure that what the user wants, we can deliver"
4. make systems more interactive
5. get more users involved in the operations of the system

Goals -- The User View

The four users interviewed saw the Data Processing Division as a service organization and specified what services should be provided. They were to furnish information that was needed, "to understand what they can do for us" (User #3 interview), and to educate the users.

The Process -- The Intermediary View

Whenever the services of the Data Processing Division was needed users were required to follow certain procedures. These procedures differed depending on the scope of the work required. When projects of a large scope were needed the "Request for Data Processing Services" procedure was used. When projects of a smaller scope, usually minor modifications to existing programs, were needed, the

"Program Change Authorization" procedure was used. The following example will serve to illustrate the "Request for Data Processing Services" procedure .

Let us assume that the legislature enacted a law creating a new tax to be levied against certain businesses in a particular industry. The Board would be assigned responsibility for levying and collecting those taxes. To carry out these responsibilities the appropriate division of the Board would be assigned the task of developing the means for collecting the taxes. The division responsible for the tax first had to identify all the eligible businesses and then develop the programs for computing their taxes. Procedures then had to be developed for notifying the businesses of the assessment. The taxes had to be collected and recorded. Based on those records programs would have to be developed that identified those eligible businesses not paying the tax.

For the necessary data processing work to take place the services of the Data Processing Division had to be requested. The first step in that procedure was the completion of a description of the required information on the "Request for Data Processing" form by the responsible division

Before the request reached the Data Processing Division for assignment to a project manager it would go through several approval processes. These would include review by a Management Analysis unit, approval by the responsible division head, and acceptance by the chief of the Data Processing Division. Once the request had been fully approved it would be assigned to a project manager and became part of the Data Processing Division work load.

The intermediary would schedule a meeting with the user to discuss the project. Prior to this meeting the intermediary would evaluate the scope of the work and estimate the number of hours required to implement the request.

During this meeting the intermediary tried to find out more about why the project had been undertaken and what kind of results the user expected. After the first meeting the intermediary worked on establishing a revised scope of work and a detailed estimate of hours. The revised scope of work and estimate of hours were taken to the supervisor who worked them into an overall unit work plan. With completion of project programming, test runs were made and reviewed first by Data Processing Division project staff, then the user, and when necessary, jointly.

The Program Change Authorization Procedure

On some occasions programs only require minor modifications. In these situations the "Program Change Authorization" procedure was available at the Board. For example let us assume that instead of creating a new tax the legislature revises a tax rate. Once again the Board was assigned responsibility to implement the change in taxes. In order for the change to go into effect a change in the computer program that generated the current tax bills would have to be made. Let us assume that in this case the change was minor, requiring only the modification of the existing tax rate computation on an existing program. The action required of the Data Processing Division was to modify the appropriate program and test it for accuracy. When the Program Change Authorization was used the user contacted the intermediary directly and explained the needed change. Based on that contact the user filled out the form and submitted it directly to the project manager responsible for that computer program. The project was then integrated into the overall unit workload. Three things distinguished this process from the "Request for Data Processing Services" process. These distinctions are: (1) the work required was

small in scope, (2) no review or approval by the Management Analysis Unit was necessary, and (3) the time required from making the request to beginning the work was considerably less.

In a recent situation Intermediary #1 reviewed a request, found it made little sense, and called to arrange a meeting with the user. The user remarked that he was glad the intermediary had called because the request hadn't made much sense to him either. The request had been written and initiated by the users supervisor. Intermediary #1 used this example to illustrate three persistent problems in defining requirements. The first problem was that frequently the people most familiar with the reports generated by the program were not the people who initiated the request. The second problem was that the Management Analysis Unit approved requests about which they knew very little and without sufficient analysis. This introduced unnecessary delay into the process. The third problem was that there was no requirement for the Data Processing Division to meet with the user.

Intermediary #1 noted the importance of language to successful interviewing. He stated that "the language of the user was different than the language of the data processor. They (data processors) carefully choose their words so each would know what was wanted by the other." He felt that by

going through this translation process the intermediary and the user were able to achieve some mutual understanding of each others problems. 1

The Process -- The User View

In general the user's overall perception of the process was in agreement with the intermediary. An exception, however, was noted by User #1. His unit had a "data coordinator" who reviewed requests before they went to Management Analysis. A number of comments were made by the four users interviewed (three users attended one interview) regarding the process and the interaction between user and the intermediary. They suggested that the meetings be structured so that the users and intermediaries could better understand each other.

All the users interviewed remarked on the importance of communication, including verbal and visual descriptions, to getting the Data Processing Division to do the required work. They expected the intermediary to probe them about their problems, and expecte to negotiate somewhat. The users felt it was important for the programmer\analyst to explain the implications and impact of their changes on other application systems. They also felt it was the

programmer/analysts responsibility to make their reports "as much like the user needs them to be". The users noted a major problem with the Data Processing Division was personnel turnover and a lack of documentation.

Shared Knowledge -- The Intermediary View

The intermediaries acknowledged that learning more about their users work was both important and difficult. Each intermediary said it would help a great deal to know more about how their programs fit into the overall picture and why the programs existed. Intermediary #2 noted that he worked with a user who was very reluctant to explain anything about how the data produced was to be used. He stated that the user gave the reason that he was too busy, that the intermediary wouldn't understand, and the intermediary had no need to know. Intermediary #2's explanation for the user's behavior was that user was being protective and "building an empire." The phrase "building an empire" was defined by Intermediary #2 as meaning that the user was hoarding his knowledge and that by not sharing it the user's importance to the organizations would be increased. The user was not identified by the intermediary and to my knowledge the user was not one of those interviewed in this study.

Intermediaries #2 and #3 noted that in the infrequent situation where a new program was to be developed this same reluctance to share information was experienced. This also happened with users other than the one mentioned above. Intermediaries were generally excluded from the process of defining the requirements for a program or system in the early stages (Manager #1 and #2 interviews). By the time intermediaries received the requests, the users involved had moved well beyond the stage of defining why the program is being developed. Not only were the users unwilling to go back and explain but the users missed the opportunity to develop a reasonable approach from a data processing interview (Intermediary #2).

The two managers interviewed and all three intermediaries felt it was important for people in the Data Processing Division to know about their users work. They also believed the time required to learn about the users work would be well spent. However, considering the users reluctance to share information and include intermediaries in planning and the Data Processing Divisions oarge work load, it seemed unlikely that much time would be spent learning the users work (Manager #1).

1 Shared Knowledge -- The User View

The users agreed that it is important for the intermediaries to understand how the users unit operates. User #1 noted that the intermediaries lack of knowledge about how and why a program was used sometimes hurt their system. The same user also felt that a few hours training could provide the necessary orientation. User #2 stated it would be helpful for the intermediary to know more about how his unit functioned.

Neither user had formal training in computers, but both were frequent users of the Board's data processing services. They acknowledged that most of their knowledge about how computers worked was gained through experience on the job.

1 Evaluation/Feedback -- The User View

The users seemed quite satisfied with the work done by the Data Processing Division intermediaries. Their satisfaction was tempered with the knowledge that the Data Processing Division "didn't have a lot to work with". (old programs, conservative management at the Board, very little encouragement for innovation). One user remarked "On a

scale of one to ten we've had some '5's' in the past and some '10's', but this group was a '9'!" With regards to timeliness, the users felt there was room for improvement. All parties acknowledged that the conversion currently being completed had put the Data Processing Division behind schedule. It appeared however, that the users did not really understand or appreciate the turmoil conversion activities can create in a data processing unit. Most of the users gave the the Data Processing Division good marks on completeness. However, one commented that occasionally pieces were missing from his reports, which he attributed to the fact that the program was used infrequently and the intermediary didn't know what to look for.

Evaluation/Feedback -- The Intermediary View

The method employed most often was telephone calls and informal meetings. Both users expressed no reluctance about letting the intermediaries know about problems. There were no formal procedures for feedback or evaluation at the Board. Most feedback came to the intermediaries after a system was in operation. During the process of defining requirements, the negotiation process acts as a feedback mechanism to the intermediaries effectiveness. One intermediary summarized the importance of communication to the process as follows: "The process depends on good

communication between the user and me. Sometimes I can give the user what he says he wants, but it's not really what he wants. You need to make them understand that you know what they are taking about. If it's all give and take on one side and not the other, it is not going to work out well. It is important to build trust and once established, take great pains to not injure it. Educate the user and be educated by them."

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SYSTEMS DATA PROCESSING CORPORATION

Systems Data Processing, Inc. was visited on September 23 and 25, 1981. This section presents the results of the interviews and observations conducted during that visit. Table 9 summarizes the interviews and observations conducted during the visit.

TABLE 9
SUMMARY OF VISIT

ORGANIZATIONAL ROLE	NUMBER OF PERSONS INTERVIEWED
Manager	1
Intermediary	3
User	1
Observations: 0	

Systems Data Processing Corporation (SDP) is a privately owned data processing service organization that has been in operation in Sacramento for over 20 years. Systems Data

currently provides services from a Sacramento office employing 25 people and a San Jose office employing 20 people. Three programmers and two analysts are employed to handle all system design and maintenance activities. The manager summarized the types of services Systems Data provided thusly; "We provide anything in data processing that will solve the problem." He noted that in the past the majority of Systems Data's business was "old style, drop-off, key-enter, and deliver reports" activities. This comment refers to the way many data processing service organizations functioned in the 1960's and the 1970's. During that period it was common practice for client organizations to periodically leave ledgers, account books, vouchers, etc. with a data processing service organization. Previously specified data from these documents would be entered into a computer (key-entry). This data would then be processed by the computer using programs developed jointly by the client (user) and programmers (intermediaries). The result of processing the data would be reports which would be delivered to the user. The manager further noted that Systems Data was now providing "modern" services to bolster their "old-style" business. The newer services were described as:

1. Online time sharing with Systems Data's computer
2. Marketing and installation of mini-computers

3. Distributed data processing

4. Complete systems analysis and design

These services are distinguished from "old-style" data processing by the greater involvement in the user's operations by Systems Data. For example, now Systems Data can analyze in detail the organization's information needs and design an appropriate system. This might require the Systems Data intermediary to work with the user and redesign forms, account books, or procedures. In the past the practice was to take the books, write programs, process the data, and produce reports. The recommended solution might involve the installation of a mini-computer at the business location to be tied electronically to the Systems Data computer. Data would be entered at the business site and stored in the mini-computer.

Periodically, the stored data would be transmitted to Systems Data. This technique is known as distributed data processing. An alternative solution might be to have terminals installed at the business site that would allow a continual, direct connection between the business site and the Systems Data computer. This technique is called online time sharing.

1 Goals -- The Manager View

2
From the manager's perspective, Systems Data's goals were profit and growth. Growth was the number one priority and included expanded sales and increased customers, as well as internal improvements.

1 Goals -- The Intermediary View

The intermediaries perception of the goals for Systems Data were to:

1. increase the timesharing business
2. provide data processing services to the community
3. add new customers

1 Goals -- The User View

In the user's view, Systems Data was a data processing service organization with two aims:

1. To provide in-house data entry and processing
2. To provide systems analysis

The user felt these goals competed for the intermediaries' attention and reduced their effectiveness.

Procedures

There were two ways the intermediaries made initial contact with their users; either the client called and requested help, or their sales/marketing representative made contact. There were no formal procedures, guidelines, or forms used by Systems Data to guide the process of defining the user's requirements or needs. The manager indicated that at various times they have experimented with various forms but found that each client's application was unique so the form didn't work or needed revision. Also forms tended to obscure the definition process. However, it was clear that some general routines for defining the information needs of users existed. The intermediaries would first spend time defining the problem with the user. This step might require two meetings that totaled from four to six hours (Manager interview). The Manager said he tried to have at least two intermediaries present during these initial meetings. This made it possible for the intermediary assigned as manager of the project, to discuss the project with someone who was also familiar with the initial needs analysis. During the first meeting the intermediaries tried to stick to data gathering and listening to the user's problems. After the first meeting a preliminary solution and bid for the job

would be developed.

At the second meeting the intermediaries would try to determine the user's output requirements and present the solution and bid. The Manager stated that he would also be prepared to negotiate at this meeting, but the primary purpose for the second meeting was to try to reach agreement on project direction, deadlines, and costs.

Depending on the complexity of the project the second meeting would run from two to four hours. One of the intermediaries noted that he liked for the client to have at one other intermediary at these meetings. When possible, the intermediary preferred to talk separately with both the people doing the job the managers of the operation). This intermediary found that, frequently, a manager thought a procedure worked a certain way, which was quite different than how it actually worked. This process might identify internal organizational difficulties that may have to be solved before progressing with analysis and problem definition. The intermediary may have to actually leave, telling the client to call him when the situation has been worked out. Once the analysis was completed and agreement reached on the scope of the project, programming began. There was apparently little interaction between the user and the intermediary during this phase. It also appeared that

the intermediary had little contact with the user prior to the start of programming. When the initial programming was completed, several major activities took place before the system was considered operational.

First, the Systems Data intermediary conducted tests on the system while beginning to train the user's personnel. The results of the tests and training would be reviewed with the user and the system would be modified as necessary. The Manager and intermediaries agreed that the tasks of systems modification and the training of people to run the system took longer than anticipated.

The Process -- The Intermediary View

In some situations the sales representative made the first contact with a client and the initial attempt at finding out what the problem/need was. If this happened the analyst spent some time with the sales representative to get an idea of the problem before meeting with the client. A difficulty was noted here. Occasionally the sales representative's view of the problem differed substantially from what the analyst found at the client's business. When the client calls direct to request service, then the analyst had a brief phone conversation to arrange a meeting with the client. The purpose of the first meeting was to discover

what the problem was and to collect data for later analysis. The analyst would then prepare a proposal prior to the first meeting based on the sales representative's specifications. One intent of the meeting was also to verify the salesman's perception and get an agreement from the client to proceed with system development. If the first meeting was for data gathering, then the time before the next meeting would be spent developing layouts and formats for the user's approval. The amount of probing and negotiation in this meeting depended on whether the purpose was to collect data for analysis, or to "close the deal".

The Process -- The User View

About a year ago the user participated with Systems Data in the development of a system. She had heard of Systems Data through her banker, so her first meeting with the analysts was for data gathering. The length of this meeting was about an hour and was "mostly a chance to vent my frustration". At this meeting the intermediary asked the user for her description of the problem. She noted that she was not ready for much more then that at that time.

Shared Knowledge -- The Intermediary View

All the intermediaries felt it was important to know about the client's business. Knowledge of accounting was considered to be a real asset in their work. They felt the best approach to knowing the client's business was to work with them. If possible, they liked to spend enough time actually doing the operation in question to be able to spot all the "exceptions" that might be missed during the analysis phase which cause problems during implementation. They felt, however, that doing the client's job was impractical.

Shared Knowledge -- The User View

The user was an accountant who had a few college level data processing courses. She found the courses useful, because they created an awareness of the appropriateness of data processing applications. She emphasized the "mechanical" aspect of computers and the problems caused by misunderstanding this aspect of their capability. Ultimately, she felt it was not necessary for the intermediary to know her job. She considered it most important that "he be concerned with the output." She felt

the intermediary "needs to be in an analytical position, which would be difficult if he knew all my job".

Evaluations -- The User View

The user stated that the Systems Data programs were "top rate". During the analysis phase development, she recognized the intermediary's reliance on her ability to communicate verbally her information needs. She felt that the analyst "doesn't always recognize potential problems, and he needs the ability to identify them before they happen".

Timeliness

The user noted Systems Data delivered their services on time. However, she also noted others did not feel the same way, which she thought was due, in part, to milestones being poorly set by Systems Data.

Completeness

She noted that both the reports generated by Systems Data and the system she designed contained nearly everything asked for by her.

Accuracy

The user had not experienced any difficulties informing Systems Data about problems encountered with the system.

Feedback -- The Intermediary View

Frequent contact was maintained throughout the process, both by telephone and through meetings. Frequently, the only feedback received was negative (when something went wrong). The assumption was if Systems Data was not hearing from the client, then the system or reports were all right. There was some indirect evaluative feedback when they got word-of-mouth referrals from a satisfied customer. All the way through the process feedback was transmitted by frequent interaction and checking with the users. A review of the products at various milestones helps. Also, trial runs and parallel runs stimulate the client to tell them how things were going.

CALIFORNIA STATE LIBRARY

The California State Library was visited on September 24/25, 1981. This section presents the results of the interviews and observations conducted during that visit. Table 10 summarizes the interviews and observations conducted during the visit.

TABLE 10
SUMMARY OF VISIT

ORGANIZATIONAL ROLE	NUMBER OF PERSONS INTERVIEWED
Manager	1
Intermediary	4
User	0
Observations: 1	

The California State Library is a state agency with responsibility for providing reference and library services to the Legislature, the Governor, and all state agencies.

The Library employs approximately 190 people. An additional function of the State Library is to provide services to other public libraries. In this capacity the Library maintains special collections such as Government Publications and the California History Library, which were available for use through the state public library system. The Library also provided services to special groups such as the blind and handicapped (Manager interview).

1 The Unit -- Administrative-Legislative Reference Section

The Administrative-Legislative Reference Section is the unit within the State Library with specific responsibility for providing in-depth reference service to the Administrative and Legislative branches of California's government. In addition to in-depth reference the Section provides quick reference, comprehensive searches, subject reference, and referral services. To accomplish these tasks, a major tool used is the online bibliographic data bases available through DIALOG, ORBIT, National Library of Medicine, and the New York Times Information Bank. Supporting the Section activities is a staff of nine, including four librarians. All four librarians do online data base searching.

Goals -- The Manager View

The primary goal of the Section was to provide current information to state agencies and legislators, and to provide in-depth reference service. Priorities were set by the individual user's needs. When a user had an immediate need for information the intermediary may set aside other work and try to get what the user wanted; or the user's request may be added to the current work load. Organizational status and political power were factors in the process of setting priorities. For example, an intermediary might be doing bibliographic research for staff members of several state agencies. An assistant to a legislator might call requesting information on some issue that the legislator needed immediately. The intermediary would have to make a judgement about whether to move the legislators request to the top of the work load or to add the request to the existing work load. Intermediary #4 commented that in most cases the legislators request would get priority. The guidelines provided were vague about dealing with this issue.

The intermediaries were in general agreement that the main goal of the Section was to meet the information needs of the Legislature and state agencies. Other goals mentioned were

2

to reach more people, to provide service that satisfied the clients needs, and to direct users to other facilities when information was unavailable at the Library.

1

The Process -- The Intermediary View

Requests for information could be initiated by telephone, appointment, or by contact through walk-ins. In each case an intermediary handled the initial contact to make a determination about the appropriateness of an online search. The determination was based on several factors. Factors noted were: (1) the complexity of the question, (2) how comprehensive of a search was required, and (3) what time span was to be covered.

If it was decided that an online search was an appropriate strategy, then further determination of the user's problem was made. If the question specified by the user was clear and well understood by the intermediary; and the user was experienced with either the Library or online searching, then little further exploration of the user's problem was needed (Intermediary #1, #4). An example might be a researcher with the Energy Commission, who had worked with the intermediary in the past, called and asked for information on passive solar heating in industrial buildings. The user stated that he wanted only journal

articles published in the last five years and status reports of projects-in-progress that are federally funded. In this case the user was very specific about his information need. The intermediary might have asked if data on non-federally funded projects-in-progress would be helpful based on her knowledge of available information resources. However, very little additional definition of the user's information requirements was needed.

If, however, the information need was unclear, or the user was inexperienced, the intermediary would encourage the user to come to the Library and to meet with the intermediary and discuss the problem. If the contact was a "walk-in", the intermediary asked another librarian to assume the reference desk duties and then met immediately with the user. The intermediaries agreed that the primary purpose of this meeting was to find out what the user needs to know. However, they noted a variety of difficulties with this process. They found that often the users did not want the librarian to know why they needed the search done. This problem was especially evident with the Department of Justice and The State Auditor General. Users occasionally would not reveal much about the reasons for needing something when calling from their office, but were much more open when discussing the issue at the Library.

Another difficulty noted was the user's misconceptions about what the State Library and computers could do for them. Some patrons were under the impression that the Library could do everything for them.

Problems were also encountered with terminology. Users were asked to provide a list of terms for searching the data bases. A frequently encountered difficulty, especially with new or popular fields (e.g., solar energy), was with "buzz words". The words given to describe the problem might be new, unacknowledged by the discipline, and not reflected in the appropriate data bases. Occasionally, these problems would not surface until the intermediary was online. Intermediaries made a special effort to pin down users about what their terms meant during the interview.

A related difficulty was encountered with the definition of the structure, boundaries, and semantics within the particular academic disciplines. Books and papers in academic fields with well established taxonomies and mutually agreed upon terminologies (e.g. physics or chemistry) can be indexed with precision. However, books and papers in fields which lack taxonomies and mutually agreed upon terms present difficulties to online searchers.

During the process of determining what the user needs, some education of the user normally takes place. If a data base has a "blue sheet" or thesarus, it will be used to explain in general terms how the actual searching would take place. This helped the user to understand the importance of providing good terms for the search. Another benefit was that this knowledge sometimes forced the user to think more carefully about what their need was and what they really needed to know. The intermediaries told the user what the output would look like that they would be receiving. They explained the option of receiving just citations or citations and abstracts. Related to this was the additional information that some of the materials might not be available at the State Library, but it might be possible to get them through other sources, or they might be obtained through contact with the author.

As the discussion took place about the problem at hand, the intermediaries noted that they began to sub-consciously work out a search strategy. This began with the decision between a manual or automated approach. Once an automated approach was chosen, the intermediary moved to questions of subject area to determine the data bases to be searched. Relying on this knowledge of the data bases structure and language, they began to ask questions regarding such subjects as which

languages were to be covered, what time span was to be searched, which geographic area was appropriate, were journal articles, books or both desired, was professional literature, popular works, or both needed.

Answers to these questions helped determine what the intermediary would do when sitting down to the terminal. After the search was completed and the results (a printout) arrived at the Library, the user was notified and the results were reviewed.

Observations

One observation was made of a session between a state employee, wanting background information on refugees, and one of the librarians. The intermediary began by noting the time of the interview, and asking what agency the person represented. The user responded with his organization name and began to describe the products wanted. He defined the term "refugee" and indicated he was interested in books and articles, both historic and current, relevant to this problem. The intermediary asked which country the user was interested in. The user specified only the United States. She then identified some potential data bases. She got out some printed materials from each data base and reviewed them with the patron. She briefly explained the search

strategies and discussed the use of search terms again. She used a manual resource (the Library of Congress Subject Headings) to further clarify the term "refugee", and to identify some related terms. She checked with the user about the urgency for this material after the terms were agreed upon. The intermediary then explained that some of the materials would be available in the library and took the user on a tour of the main circulation room and the Government Publications Library.

Evaluations -- The Intermediary View

Intermediary #1 found that the lack of a formal system for feedback was a handicap. She noted that an evaluation form which was developed several years ago was never used. Currently, user satisfaction was judged by return business and referrals. The only real opportunity to judge how well the search met the user's need was during the review of the results with the user. However, the user usually needed to spend time going over the results thoroughly, before making a reliable evaluation. A related difficulty with this system was that many of the printouts were mailed to the user and were never reviewed with the intermediary. The Section did occasionally receive letters of commendation (including a recent one from the Governor's Office).

Intermediary #4 noted that she, occasionally, called the user to get feedback, but her workload prohibited much of this activity. Her rule-of-thumb was that if over five data bases have been searched, she would try to call the user.

FORMS ANALYSIS SECTION

In the process of defining user information needs this investigation uncovered a variety of forms used to record data about users requests and printed materials intended to guide either the user or the intermeidary.

The purpose of this section is to present facsimilies of the various forms and aids collected during the course of the investigation and to describe their use. Each organization's forms will be dealt with separately.

Of the six organizations visited five had some type of form used to guide the process of defining output (see Table 11).

TABLE 11
SUMMARY OF FORMS AND USER AIDS

Organization	Aids to User/ Intermediaries	Request or Analysis Form
CALTRANS	CALTRANS EDP Manual"	"Project Initiation Form"
	Processing Environment Factors"	
	System Control Factors"	
California Almond Growers	"Guidelines for Preparation of the Statement of Requirements"	"Data Processing Programming Request"
Univ. of California, Davis	How to Request a Computer Search" "Interpreting BIOSIS Citations"	"AIRS Computer Search"
	CAB Abstract Citations"	
	"Automated Information Retrieval Services"	
State of Equalization	None	"Program Change Authorization"
		"Request for Data Processing Services"
Systems Data Processing, Inc.	None	None
Admin., Legislative Reference Library	Policy for Use of Online Systems" ERIC" National Newspaper Index" ABI/INFORM" BIOSIS"	"ALR: M101"

1 CALTRANS

CALTRANS had one form that was used to record the information needs of their users. Called the Project Initiation Form, this form provided space for the user to make a narrative description of the objectives of the project being requested (see Figure 5). Blocks were provided to specify the start and end dates and the elapsed time estimated. Additional space was provided for estimating both dollar and person-year costs, specifying project team members, and displaying a project cost breakdown. A final block for user and "EDP" approval was provided.

CALTRANS EDP MANUAL

SECTION: SYSTEM DEVELOPMENT AND MAINTENANCE
 subject: Structured Development Process

Page: E-16
 Date: 03/01/81

Exhibit L - Project Initiation Form

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF COMPUTER SYSTEMS
PROJECT INITIATION FORM

Project Title		
Traffic Signals Trouble Call System		
Objective (Action Purpose Statement)		POS # F-2-MC-54
To eliminate manual record keeping and reporting of trouble calls.		
Start Date	End Date	Elapsed Time (months)
7-1-81	6-30-82	12 Months
APPROXIMATE PROJECT BY .85		
APPROXIMATE PROJECT COST \$ 55,000		
PROJECT LEADER Bob Ryan		
EDP ANALYST Bob Ryan		
USER CONTACT Ken McDaniel		
USER DECISION MAKER Ken McDaniel		
Summary		
Cost Breakdown:		
Analysis	.40	\$16,000
Programming	.35	11,000
Data Guidance	.05	2,000
RDE		11,000
Inquiry (CICS)		4,000
Processing		11,000
AGREEMENT TO DO EDP PROJECT AS DESCRIBED ABOVE:		
USER APPROVAL	<i>[Signature]</i>	DATE 4-7-81
EDP APPROVAL	<i>[Signature]</i>	DATE 4-10-81

Fig. 2 CALTRANS Project Initiation Form

1

6

- 134 -

Processing Division, and Mangement Analysis. Approval blocks are provided to certify sufficient funds are available and that the head of the users department has approved the request.

GA-157 FRONT REV 4 (7-74)
REQUEST FOR DATA PROCESSING SERVICE

STATE BOARD OF EQUALIZATION

INSTRUCTIONS: Complete front in full and forward to Management Analysis. Attach additional supporting material as required. Information regarding the processing of requests can be found in BEAM Section 7430.

No. _____

REQUESTING UNIT	REQUESTOR'S NAME	DATE
TITLE (Identify the request briefly but clearly)		
NEED (Describe the nature of the request and the date required)		
PROPOSED SOLUTION (Explain the steps or changes that you think would be necessary to fulfill your request. Mention units, forms, procedures, etc., but do not go into detail of Data Processing Service.)		
BENEFITS (Describe the benefits you believe would be realized. If there is a monetary savings, show the method of computation. If benefits are intangible or involve no savings, describe the improvement. If there are disadvantages, describe them also.)		
		TOTAL BENEFITS \$ _____ Yr.
RESOURCE EFFECTS (Identify savings or costs that would result. DO NOT include Data Processing Division costs.)		
		Initial Costs \$ _____ Continuing Costs \$ _____ Yr.
APPROVAL FOR EVALUATION BY DEPARTMENT HEAD		
By _____ Date _____		
MANAGEMENT ANALYSIS		
Review of the request has been assigned to _____		
By _____ Date _____		

Fig.3. Board of Equalization Request for Data Processing Services,

EVALUATION AND APPROVALS

No.

DATA PROCESSING DIVISION EVALUATION

SUMMARY OF CHANGES NECESSARY TO ACCOMPLISH THE REQUEST

Estimated Initial Cost _____ Estimated Annual Continuing Cost _____

RECOMMENDATION

- ☐ Is feasible and can be implemented by _____ Date _____
- ☐ Is feasible but implementation should be delayed (see attached report)
- ☐ Should not be approved (see attached report)

By _____ Date _____

MANAGEMENT ANALYSIS EVALUATION (Include Cost/Benefit Ratio if applicable)

Payback Period = _____

By _____

Date _____

MANAGEMENT ANALYSIS RECOMMENDATION

- ☐ Adoption recommended
- ☐ Implementation not recommended at this time
- ☐ Adoption not recommended

Chief, Management Analysis Section

Date _____

BUDGET IMPACT ANALYSIS

I certify that there is sufficient budgetary resources available to process this request.

Assistant Executive Secretary, Administration

Date _____

APPROVAL FOR IMPLEMENTATION BY DEPARTMENT HEAD

By _____ Date _____

POST ANALYSIS REQUESTED ☐ Yes ☐ No Date _____

Fig.4. Board of Equalization, Request for Data Processing Service, Reverse Side.

PROGRAM CHANGE AUTHORIZATION

Date _____

Item Title _____ Program Name _____

Function Code _____ Project Number _____

Requested by: _____

Description of the Change _____

The following areas may require modifications. If changes made, initial and date. If none required, indicate N/A and - - - - -.

	DATE	INITIALS		DATE	INITIALS
Master Systems Book			Narrative		
Indexes Work (Order, File etc.)			Functional Analysis		
Schedules (Computer, Data Tm.)			Hierarchy Chart		
System Flowchart			Data Element Charts		
Procedures Flowchart			Record Layouts		
Work Orders			Printer Layouts		
Job Flow Summaries			External Table Desks		
Computer Operations			Source Libraries		
Library Operations			Test Data		
Control Operations					
Data Trans Operation					
Catalog JCL					
JCL Lists					

Change Authorized by _____ Date Authorized _____

Target Date _____ Actual Effective Date _____

Programmer:

Assigned for Change _____

Date Assigned _____ Date Completed _____

Research Hours Required Estimated _____ Actual _____

Development Hours Required Estimated _____ Actual _____

Computer Hours Required Estimated _____ Actual _____

Approved By _____

GA-61 REV. 3 (7-77)

STATE BOARD OF EDUCATION
DATA PROCESSING DIVISION

Fig. 5. Board of Equalization, Program Change Authorization

The California Almond Growers Exchange

The Exchange had a one page form used by intermediaries to record their users request. Called the Data Processing Programming Request (see Figure 3), it had two sections for users to fill out. The first section described the unit and requestor and contained a line for an approval signature. Space was also provided for users to describe the request. This space was followed by room for a description of the benefits and estimated dollar value. The last user section asked the user to specify a "date wanted".

The remainder of the form was completed by the Data Processing unit. This section asked for estimates in hours and dollars for analysis, programming, and test time.

REQUEST NO. _____

DATE _____

DATA PROCESSING PROGRAMMING REQUEST

THE FOLLOWING INFORMATION MUST BE SUPPLIED BY THE REQUESTER:

DEPARTMENT: _____

NAME: _____ DEPT. APPROVAL: _____

DESCRIPTION OF REQUEST: _____

DESCRIPTION OF BENEFITS AND ESTIMATED DOLLAR VALUE: _____

COMPLETION DATE WANTED: _____

ESTIMATED DATA PROCESSING COSTS:

	HOURS	DOLLARS
ANALYSIS	_____	_____
PROGRAMMING	_____	_____
TEST TIME	_____	_____

ESTIMATED COMPLETION DATE: _____

REQUEST: ACCEPTED ☐ REJECTED ☐ TO GUIDANCE COMMITTEE ☐

COMMENTS: _____

22156-R

Fig. 6 Almond Growers Exchange Request Form

1 The University of California, Davis

The University of California, Davis libraries have a one page form used to record information about online bibliographic data base searches. The form, called the AIRS Computer Search Form (see Figure 13), has three sections and is filled out by intermediaries. The first section has data about the user such as name, address, affiliation, and the amount of money the search should not exceed. The second section is primarily for administrative use. The third section takes up roughly two thirds of the page and provides space for the intermediary to describe the problem in question. Specifically it asks for a "Statement fo the Search." I was able to observe an intermediary using this form during two question negotiation sessions and found that the form was used to record the terms that would be used during the search, to indicate some relationships between terms, and to record the numbers of citations retrieved using each term (Observations #1 and #2 at the University of California, Davis).



**AUTOMATED INFORMATION RETRIEVAL SERVICES
UNIVERSITY OF CALIFORNIA, DAVIS LIBRARIES**

Bio/Ag Reference
753-4184

Physical Sciences Library
753-0459

Humanities/Soc. Sci. Reference
753-1126

Health Sciences Library
753-1214

NAME _____ PHONE _____ UC DEPT. _____ ACCOUNT # _____

ADDRESS _____ Cost not to exceed \$ _____
(Payable to The Regents of the University of California)

USER AFFILIATION:

☐ UC ☐ Faculty ☐ Government
☐ CSUC ☐ Graduate ☐ Business
☐ Other Academic ☐ Undergraduate
_____ ☐ Staff

OFF-LINE BIBLIOGRAPHY Date Received/Sent

☐ Call upon receipt _____
☐ Mail _____
☐ Pick up _____
SIGNATURE _____

THIS SPACE FOR OFFICE USE ONLY

CHARGES \$ _____ PAYMENT: Receipt # _____ SEARCH NO. _____
Interviewed By _____ Date _____
Dept. Acct. _____ Searched By _____ Date _____
Sundry Debtor _____ Preparation Time _____

DATA BASES: ☐ RETRO ☐ SDI SYSTEM: ☐ LRS ☐ BRS ☐ SDC
☐ RECON ☐ NLN

TITLE OF SEARCH _____
STATEMENT OF SEARCH _____

Fig. 7. University of California, Davis, Computer Request Form

1
California State Library:

1
Adminstrative-Legislative Reference Section

The form used by the Section to record data for an online search was an all purpose form used for all reference questions. The form had three parts. The first part records data on the user and some administraitve information. The second section is blank and is used to record the intermediaries notes about the users information needs. The third section provides space for indicating the disposition of the reference interview. The intermediary can check whether the user was referred to another section or the type of search to be conducted.

Date received _____ Time _____
 NAME _____
 AGENCY _____
 Assembly [] Senate [] Other []
 ADDRESS _____

 ROOM _____ PHONE _____
 Charge to: _____
 Needed by: _____
 Sold ALR [] []
 Sold Circ [] []
 Interagency [] []
 U.S. Mail [] []

Referred to CSL Section or other agency _____
 Libn. _____ Time: Quick _____ Research _____
 Computer Search _____ Bibs _____
 Clerk _____ Time: Quick _____ Research _____
 ALR: N101 Rev. 4/80

Fig. 8. Administrative-Legislative Reference Section,
Request Form

1 Aids/Guides to Users and Intermediaries

Of the six organizations visited four had some type of printed aids for their users (see Table 8). This section will describe each of the aids found.

1 CALTRANS

CALTRANS was the only organization of the six visited that had a manual for aiding intermediaries in the systems and program design/implementation process. Selected pages are in Appendix E. Called the CALTRANS EDP Manual the document introduces the reader to a systems design approach known as the Structured Design Development Process. The 56 page manual describes seven phases in what it terms the "System Life Cycle" (CALTRANS EDP Manual, p. 4). These phases are as follows:

Phase 0 - Opportunity Analysis

Phase 1 - EDP Analysis

Phase 2 - Design

Phase 3 - Development

Phase 4 - Implementation

Phase 5 - System Operation and Use

Phase 6 - Post Implementation Analysis

Of these seven phases only Phase 1 -- EDP Analysis presents information designed to aid the intermediary in defining a users needs.

Eight steps are outlined within the EDP Analysis Phase. They are as follows:

1. Complete the Project Initiation Form
2. Define the users requirements
3. Analyze the existing systems
4. Investigate other existing systems
5. Develop alternative solutions
6. Screen alternative solutions
7. Recommend an alternative solution
8. Present the Feasibility Study Report
for review and approval

Although steps one through seven have an impact on the process of defining and negotiating users information needs, of particular interest to this study is step 2. Information on how to conduct the activities in this step are covered on one page. To summarize the information covered on that page, the intermediary is instructed to review the users specifications and, if none exist, to meet with the user and assist in developing new specifications. The intermediary

was then told that "information obtained from the users specifications or from interviewing is (to be) incorporated into the Project Requirements Report" (CALTRANS EDP Manual, page 13). The reader was informed that the Project Requirement Report should contain a historical perspective, scope of the project, solution objectives, assumptions made concerning the project, constraints, performance criteria (defined and weighted), and limitations and failures of the current system. Finally, the intermediary is instructed to obtain the users written approval of the Project Requirements Report.

1 The Almond Growers Exchange

A one page "Guidelines for Perparation of the Statement of Requirements" was found at the Exchange. The Guidelines describe some general procedures for obtaining a statement of requirements from users.

GUIDELINES FOR PREPARATION OF THE STATEMENT OF REQUIREMENTS

The first phase of improved programming technologies is actually the preparation of the initial HIPO package. The source of information for the preparation of this initial HIPO is the statement of requirements, it is therefore necessary to establish a few guidelines for its preparation.

The statement of requirements is one of the most critical elements in the design of a system, yet it is typically the most difficult to obtain. In most cases, the preparation of this document requires many reviews and rewrites in order to produce the desired results.

The use of structured walk-throughs should be used to insure all objectives specified in the statement of requirements have been included in the system design.

- I. This document should be prepared jointly by the user and a data processing analyst.
- II. The preparation of this document would normally require many reviews in order to refine the requirements and objectives.
- III. There is no standard form for this document, however, the following information should be supplied:
 - A. Objectives:
 1. What it will do
 2. When available, what it will not do
 3. Who it will serve
 4. How is it related to current procedures (both manual and computerized)
 - B. Data sources
 - C. Data output
 1. If a report is involved, the following should be supplied:
 - a. Items to be included
 - b. Report sequence
 - c. Report title
- IV. This document must be completed and approved by both the user and data processing before preparation of initial HIPO design package is started.

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Fig. 9. Almond Growers Exchange Guidelines

1 University of California, Davis

Several aids designed to inform and assist users were available at the University of California, Davis.

1 Automated Information Retrieval Services

The first form, entitled "Automated Information Retrieval Services", is a four page handout available to prospective users of online services at each University library. This aid provides a discussion of the advantages and limitations of computer searching followed by a discussion of the following six subjects:

1. The concept of computerized literature searching
2. the types of searches available at the University of California, Davis
3. the prices for each type of search
4. methods of payment
5. how to request a computer search
6. and what to expect from the search result

A facsimile of this handout can be found in Appendix D.

How to Request a Computer Search

A second handout was available for potential users at the University that specifically addressed the question of "How to Request a Computer Search" (see Fig. 14). This aid instructs the user on how to prepare for and fill out an "AIRS Computer Search" form. Specific, detailed instructions on the process of selecting search terms are included.

Two additional aids were provided that were designed to assist the user with interpretation of the results. These one page aids were "Interpreting BIOSIS Citations" and "CAB Abstracts Citations". Both aids are similar only one will be presented in this section. "CAB Abstracts Citations" can be found in Appendix D).

Interpreting BIOSIS Citations

Samples of a citation from the BRS and DIALOG systems are displayed on the BIOSIS aid along with instructions for interpreting the citation.

How to Request a Computer Search

1. Check the card file at the appropriate Reference Service Desk to determine if there are data bases that contain material relevant to the area of your subject.
2. Look at the printed versions of the relevant data bases to insure that items of interest are indexed there.
3. Obtain a computer search form from the librarian at the Reference Service Desk.
4. Complete the top and bottom portions of the form. If you want abstracts, remember that this usually doubles the price of each citation retrieved. Also, if you specify English language only (applicable only on some data bases), this will also exclude foreign language articles with English summaries.
5. Fill in TITLE OF SEARCH. This should be a short description of the topic;
e.g., *artificial insemination in swine*.
6. Fill in STATEMENT OF SEARCH. For this section, it is helpful to think of your subject in terms of the separate concepts involved. For instance:

Artificial insemination Swine

If you have seen any articles on the subject, look at them to determine what other words need to be added to retrieve all relevant articles. Think of synonymous terms that may have been used by authors writing articles on the subject. If you are searching for the effects of various pesticides on fruits, specify the common and trade names of the various pesticides, as well as the specific fruits. In the search on artificial insemination in swine, the terms *Boar, Pig, Sow*, etc. should be added to the swine concept to increase the retrieval of relevant articles. If there are aspects of the subject you wish to exclude, please indicate them also.

In addition to the key words and terms you supply, some data bases may also be searched by using numerical codes or descriptors that eliminate the need for long lists of key words. If the card file for computerized data bases indicates that there is a guide or thesaurus for the data base in which you are interested, you may wish to consult it. Ask at the Reference Service Desk.

If there are phrases that are commonly used in articles dealing with your subject, include them also, since the computer can search phrases as well as individual words.

If you know which data base(s) you wish to have searched, please specify. If not, the reference librarian doing the search will examine your request and select the data base that will best meet your needs.

7. Give the completed search form to the librarian at the Reference Service Desk. If the librarian who searches the data base for you has any questions, you will be contacted before the search is run.

Search Results

You may expect that your bibliography will be ready to be picked up within a week after you submit a search request form at the Reference Service Desk. If you need the material more quickly, please indicate this on the search request form.

Fig. 11. How to Request a Computer Search.

INTERPRETING BIOSIS CITATIONS

Fig. 12. BIOSIS

Your computer search may have been done on one of two search systems. Samples of each printout appear below.

Each citation on a BIOSIS printout has an 8-digit accession number which enables one to locate the corresponding abstract, citation, or content summary.

The first two digits of the number tell which publication -- Biological Abstracts (BA), Bioresearch Index (BIOI) or Biological Abstracts/RRM (BA/RRM) the citation is from. The last six digits refer to the individual citation. BA citations will provide an abstract in the printed copy, BA/RRM will provide a brief content summary and BIOI citations provide no more information than found on the BIOSIS printout.

If the first two digits are:

50-68
69 - and up, and the citation
is 1980 or newer.

69-78 and the citation is 1978
or older
16-17

18 - and up

The publication is:

Biological Abstracts
eg. 63004587 is vol 63,
abstract #4587

Bioresearch Index
eg. 16021348 is vol. 16,
citation #21348

Biological Abstracts/RRM
eg. 18009807 is vol. 18,
content summary #9807

LOCKHEED DIALOG SAMPLE CITATION

1/3/1
70077846
INACTIVATION OF LIVER ALDOLASE EC-4.1.2.13 IN
FASTING RABBITS EVIDENCE FOR THE ACCUMULATION OF
2 DIFFERENT IMMUNO REACTIVE FORMS
PONTREMOLI S; MELLONI E; SALAMINO F; SPARATORE
B; MICHETTI H; HORECKER B L
1ST. BIOL. CHEM., UNIV. GENOA, GENOA, ITALY.
ARCH BIOCHEM BIOPHYS 203 (1). 1980. 390-394
CODEN: ABBIA

BRS SAMPLE CITATION

7
AN 70077846
AU PONTREMOLI S. MELLONI E. SALAMINO F. SPARATORE B.
MICHETTI M. HORECKER B L.
TI INACTIVATION OF LIVER ALDOLASE EC-4.1.2.13 IN FASTING
RABBITS EVIDENCE FOR THE ACCUMULATION OF 2 DIFFERENT
IMMUNO REACTIVE FORMS.
SO ARCH BIOCHEM BIOPHYS. 203 (1). 1980. * EN * 390-394

UCD Bio/An
2/81

1
The California State Library

1
The Administrative, Legislative Reference Library

The Administrative-Legislative Reference Section had several aids for users and a "Policy for User of On-Line Systems".

The Policy is a brief statement to intermediaries outlining procedures for setting priorities and for placing limitations on searches. There were no other guidelines to intermediaries.

Several aids were available to assist users. They were in the form of handouts that described the results a user would receive from a particular data base. Three handouts were available, and all followed the same format. Because of the similarity of the aids only one, the ERIC handout, will be described in this section. Samples of the other handouts are found in Appendix D.

The ERIC handout has two sides. The front side provides a brief description of ERIC and presents a sample abstract from a search done on the DIALOG system. Codes are used to describe the terms found on the abstract with two code lists provided for translation. The reverse side has a sample of

a similar search done on the ORBIT system.

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TELEPHONE (916) 445-2383
TWX 910-347-3553

POLICY FOR USE OF ON-LINE SYSTEMS

The California State Library Administrative-Legislative Reference Section (ALR) provides reference and research services for employees of state administrative agencies and the Legislature working on state business. Research requests will be handled in the order they are received as staff workload allows. To obtain maximum results for all research requests, ALR policy is as follows:

1. ALR librarian will conduct an interview with the original requester.
2. ALR librarian will use professional judgment as to when automated information sources are appropriate, and which data bases should be used.
3. In order to ensure just sharing of available staff and computer time, some limitations on the number of searches for an individual may be necessary.
4. Because of limited resources, off-line printing will be limited to approximately 100 citations.

ALR:bjs
4/77

Fig.13. ALR Policy Statement

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TELEPHONE (916) 445 2585
TWR 916-367 3553

ERIC

ERIC (Educational Resources Information Center) database comprises report and journal literature in education and related areas. Topics covered include:

- career education
- counseling and personnel services
- education management
- information resources
- early childhood education
- tests, measurement, and evaluation
- adult, vocational and technical education
- higher education
- reading and communication skills
- handicapped and gifted children
- library and information sciences
- language and linguistics
- rural education

Online ERIC corresponds to two printed indexes: Resources in Education (RIE) and Current Index to Journals in Education (CIJE). RIE coverage is from 1966 to date, and CIJE covers 1969 to date. ERIC contains approximately 30,000 records per year of coverage.

On Lockheed DIALOG, a typical unit record would be:

Accession Number → ED15552, SERIALS
 CHN → Chemistry, Teachers' Curriculum Guide for the Thirteen-College Curriculum Program, /TI
 AUS → Author, Editor, and Reviewer /CS
 Institute for Services in Education, Inc., Washington, D.C. /SA
 Sponsoring Agency: National Inst. of Education (NIE), Washington, D.C.
 PNA → Project No. 1 NIE-0047
 CNA → Contract No. 0 DEC-004-0700-0701 /NT
 NIE, Later 71 Under RFP: 004-0700-0701
 EJP: Price of \$0.70 to NIE-004-0700-0701
 Descriptors: Chemistry/College Science/Curriculum/Curriculum Development/Disadvantaged Youth/Higher Education/Instructional Materials/Upper Colleges/Physical Sciences/Science Education/Teaching Guides } /DE
 Identifiers: Thirteen College Curriculum Program /D
 This manual is a teacher's manual in a series of manuals that make up the core of a Physical Science course designed for the freshman year of college and used by teachers in the 27 colleges participating in the Thirteen College Curriculum Program. This program is a curriculum revision project in support of 17 predominantly Negro colleges and reflects educational research in the area of disadvantaged youth. This unit covers the fundamental principles of chemistry, including distinguishing features of four chemical classes of elements and patterns of chemical combinations of elements. Generalizations are provided to illustrate the major concepts of chemical combination. (NIE)

POSITION	FIELD NAME
AC	Academic Authority Code
AI	Author
CM	Contributor Code
CH	Contributor Number
DI	Document Type
ED	Group Code
EN	Index
FI	Journal Name
PN	Project Number
PS	Project Number
SC	Source Code or
SP	Sponsoring Agency Code
TI	Title
TR	Year

SUFFIX	FIELD NAME
00	Basic Index includes all seven fields
01	Author
02	Corporate Source
03	Document
04	Identifier
05	Subjective Data
06	Sponsoring Agency
07	Year

OVER

Fig. 14. ERIC Handout

ANALYSIS BY VARIABLES

The following section presents an analysis of the data collected by variables identified in the last section of Chapter One. Each variable was selected based on a need to answer the three research questions posed in Chapter One.

ORGANIZATIONAL VARIABLES

Structure -- Size

Of the six organizations visited, two employed over one hundred people in data processing and were considered large. One organization employed twenty seven people and was considered medium in size. The remaining three organizations had less than ten employees working with computers.

Organizational size appeared to relate to how an organization defined the information needs of its users. Large organizations tended to have more administrative

procedures than small ones. Organizational size also seemed to have some relationship to what took place during the interpersonal process of defining users information needs. In the two large organizations there was less social contact between users and intermediaries than in the medium and small organizations. There appeared to be no relationship between organizational size and bibliographic data base searching. Similar processes for determining needs were employed in each of the bibliographic libraries.

1 Type of Service and Frequency of Meeting

The type of service provided by the organization had some effect on how organizations defined their users' needs. The two bibliographic libraries had standard procedures that involved a maximum of two meetings with their users. The information needed by bibliographic data base users was analogous to the type of questions asked of librarians, and the intermediaries were all trained librarians.

Intermediaries at the data processing service bureau met with users less frequently during the user needs assessment phase, but the meetings were longer than those found in other organizations.

Government agencies met more often while defining users' information needs. The meetings usually lasted about one hour.

Procedures

The procedures employed by organizations affected how information needs were defined. It was found that larger organizations employed more administrative procedures that governed whether or not a process would be initiated. Administrative procedures in bibliographic data base settings served primarily to screen out ineligible searchers or to record charges for services. The two profit making organizations employed very few procedures to guide the process. While one had no formal procedures, the other had only a formal procedure for settling disputes when the data processing unit felt a project should not be undertaken.

Only one organization, CALTRANS, had any guidelines to aid intermediaries in discovering users' needs. These guidelines were sketchy and provided no formal structure to the process. It appeared that even this procedure was rarely used.

Charges

Three methods were identified for covering the cost of operating the computer. They were (1) charge the user directly, (2) charge the users unit account, and (3) absorb the costs in the intermediaries unit.

Method one, charging the user directly was found in one of the bibliographic settings and in the computer service bureau. Method number two, charging the users unit account, was used in each of the organizations that had their own data processing units. The method of not charging the user was unique. The bibliographic organization was specially funded by a legislative body to provide research services.

Forms/Procedures

Forms were used by five of the six organizations to record data about the users information need. In the case of government organizations, a form was used primarily to describe the objectives of the work rather than to serve as a guide for discovering the users' information needs.

While four of the six organizations were found to have both low levels of administrative and interview procedures, the two government organizations were found to have high levels of administrative procedures. Five organizations appeared to have low levels of formality during the process of defining users' information needs. These organizations had some formal procedures but they were not strictly adhered to. One of the government organizations had formalized procedures and attempted to enforce adherence to those procedures.

Goals

Although only one of the organizations visited provided a formal statement of goals, there appeared to be a high level of agreement among managers and intermediaries regarding the units' goals in all six organizations.

There also appeared to be high levels of congruence between users' and intermediaries' perceptions of the goals of the intermediary user unit.

The consensus was that data processing was to serve the information needs of its users.

INTERPERSONAL VARIABLES

Question Negotiation

Interaction

The amount of interaction required to define a user's information needs appeared to be related to the type of service sought from the intermediary. Requests made of bibliographic intermediaries were reported to require a maximum of two meetings to complete the definition of the problem. In organizational settings the type of request was also related to the frequency of interaction. The number of interactions ranged from one meeting (for a change on a program) to hundreds occurring over the life of a five year project. There appeared to be no necessary relationship between the frequency of interactions and user satisfaction with the results.

Probing

There appeared to be a relationship between the amount of probing and the outcome of the process. When the intermediary lacked familiarity with the data or the program to be used or the user was unclear about his/her information

need and little probing took place then the results were generally unsatisfactory. In at least one government organization intermediaries reported feeling constrained from probing because of the "conservative" nature of the organization.

In the bibliographic settings there appeared to be high levels of probing. This was attributed, in part, to the inclusion of training in the reference interview as part of a librarian's curriculum.

In one organization there appeared to be low to medium probing, but users reported high satisfaction with the intermediaries' services. The size of the organization permitted the intermediaries to know many of the users on a first name basis and to know their work as well. This apparently had two effects; (1) less probing was necessary, and (2) when needed, probing was easier to accomplish.

Discussion

The amount of discussion during the process seemed to be related to: (1) the intermediaries skill at probing, (2) how well the user was able to express the need, (3) the frequency and quality of previous interaction between the participants, and (4) the subject matter of the search. In the bibliographic settings, when the participants had had

good past interactions, subsequent sessions took very little time, required little discussion or probing, and were frequently conducted over the telephone.

Where the intermediary did not know the subject matter, was unfamiliar with the way a program worked, or was unclear about the purpose for the request, the discussion tended to be lengthy. The amount of discussion alone was insufficient to affect the outcome of the process. It appeared that the intermediary's skill at drawing information out of the user and the users' willingness to reveal their real information needs (or to discover their needs) were more important factors.

Shared Knowledge -- The User

Few of the users had formal training in computers. However, most had gained some knowledge of the limitations and capabilities of computers through their jobs. Users were familiar with the impact their requests had on intermediaries' work activities. The effect on the process of users having formal training in computers was generally favorable. Those users with the training felt it made their role as user easier. Several of the users expressed a

desire for more training and felt it would aid them in their work.

The user of the bibliographic computer noted that his knowledge of the capabilities and limitations of computers caused him to mistrust the results of the search. He added, however, that despite his mistrust the results were still acceptable and better than what he would have gotten if he had done the job using manual sources.

1 Shared Knowledge -- The Intermediary

The knowledge intermediaries possessed about the user's work appeared to affect the outcome of the process. When the intermediary knew very little about the use of the output to be generated, discussions took longer, more probing was required, and more meetings were necessary. Where information about the use of a report was denied the report was usually unsatisfactory.

In data processing settings, intermediaries and users alike agreed that it would be helpful for intermediaries to spend time working in users' organizations. In one situation, a five year development project, the intermediary maintained a desk in the users' office. The user felt that having the intermediary was a critical factor in the success of the

project.

RELEVANCE VARIABLES

Timeliness

The ability of intermediaries to deliver reports on time appeared to have little affect on the user's judgement of relevance. Several users noted that intermediaries were well known for not delivering products when promised and that late reports were not usually a factor in rating the intermediaries services. Reports appeared to be delivered when promised in bibliographic settings but there was a delay of several days to a week in getting the printouts to the user.

Accuracy

Several users pointed out that creating accurate reports was what computers did best, and they rarely had complaints about accuracy. However, several of the users noted that they continued to do random checks of data for accuracy. Accuracy did not seem to be a factor in bibliographic settings.

Completeness

Users in bibliographic settings tended to be more concerned with completeness than in the other settings. This appeared to result from the users' lack of knowledge and control over the contents of the data bases. They were never certain that they were getting everything that was appropriate to their questions.

In organizational settings, users tended to have more knowledge and control over their data sources and were more confident that the reports they received were complete.

User Satisfaction

Overall users seemed to be satisfied with the quality of services delivered by their intermediaries. In the large government organizations, users expressed misgivings about the intermediaries' knowledge of their operations. One user expressed sympathy with the intermediary's plight of being responsible for programs yet not knowing who wrote the them. Dissatisfaction with the intermediaries' services appeared to be attributed to organizational barriers that prevented the participants from communicating.

OTHER VARIABLES

Several other variables were uncovered in the course of this investigation that appeared to affect the process of defining computer users information needs. These were costs, documentation, and turnover in personnel.

Costs

Who paid for the use of the computer seemed to have an effect on the process. Users in one bibliographic setting were required to pay for the use of the computer which appeared to constrain them. In the non-paying bibliographic setting the fact that the online searching services were free appeared to encourage lengthy and more comprehensive searches. The type of output the user received also appeared to be affected by who paid for the search. The for-pay bibliographic sites also provided printed materials to users explaining their services and how to make a request while the non-pay bibliographic site did not.

There appeared to be a difference in the interaction of participants at the government organizations, at the private food processing organization, and at the computer service bureau. The intermediaries in government organizations met

more frequently to define their users' information needs. It was not clear, however, if this was due to the complexities of the projects or the result of organizational dynamics. Government intermediaries seemed less able to plan for future projects and set priorities than intermediaries at private enterprises. In short, government organizations appeared to be less capable than private enterprise in managing the process of defining their information needs and then developing systems to meet those needs.

Documentation

The lack of documentation (narrative description) of a system or program appeared to affect the process in large organizations. Intermediaries in large organizations expressed a need for documentation of how and why their programs were written and to know how changes in the programs would affect the operation of other programs. Where documentation was lacking, the intermediaries were required to spend additional time with users trying to get answers to those questions. If the answers were unavailable or unobtainable, intermediaries were at a disadvantage when discussing changes to existing programs or when discussing the development of programs to replace older ones.

Personnel Turnover

High turnover in intermediaries were reported in the large government organizations. Managers in both organizations reported that many intermediaries had less than two years experience in their present jobs. The turnover appeared to have an undesirable impact on the process of defining users information needs because of the long length of time needed to understand the way programs and systems were used. The amount of time an intermediary had been working with a user was apparently related to the intermediaries knowledge of: (1) the user programs, and (2) the users work. Knowledge of these two factors could be gained through experience with the user and reading documentation that explained the program's operation. Adequate documentation did not exist in the large organizations so the intermediaries had to rely on their experience with users. Frequent turnover in intermediaries meant less experience with users which thereby reduced the effectiveness of this approach.

Attitudes

Librarians and bibliographic searchers appeared to be deferred to as experts with privileged knowledge and were

generally held in high esteem by users. Programmers and systems analysts also appeared to be regarded as possessing expert knowledge. However, users in data processing settings did not seem to defer to programmers and systems analysts as persons with expert knowledge. Rather, data processing users seemed to perceive their intermediaries in subordinate roles.

SUMMARY OF FINDINGS

This section summarizes the findings reported in the previous seven sections of this chapter. Following the summary of findings, the three research questions posed in Chapter One will be addressed.

Organizational Variables

1. In large organizations data processing managers needed to know, in advance, the type and amount of services required of their personnel.

2. Intermediaries and users tended to dislike the use of forms and procedures. Where they existed the participants appeared to only tolerate them and tried to circumvent or avoid them whenever possible.

3. In organizational settings users were more likely to approach the intermediary with a firm idea in mind about exactly what was needed.

4. When intermediaries produced exactly what was requested with little discussion or negotiation, it was not unusual for the user to be dissatisfied with the outcome.

5. Intermediaries in large organizations tended to be cut off from their user's work and subsequently had a difficult time being knowledgeable about the use of the programs and/or systems they designed and maintained.

6. There was less interpersonal communication between users and intermediaries under the conditions described in Finding #5. However, the participants acknowledged the importance of communication.

7. Intermediaries in smaller organizations had more interpersonal communication with users.

9. Users almost universally perceived that the intermediaries' role was to provide service.

10. Two of the organizations had some form of post-implementation review but in practice the procedures were never invoked.

11. The type of service provided by the intermediaries', organization influenced the process of defining computer users' information needs.

Interpersonal Variables

1. The more intermediaries knew about the users' problems and the better they understood the users' needs; the greater the likelihood that programs and systems would be provided that adequately met those needs.
2. Intermediaries frequently lacked sufficient familiarity with the uses of their systems.
3. The more specific users were about their needs, the greater the likelihood that intermediaries would deliver the desired result.
4. Searches conducted in scientific or technical data bases for professionals, researchers, or technicians who also worked in those fields, were generally easier to perform and produced more satisfactory results.
5. Users generally did not understand computers or the functions of intermediaries.
6. Users demonstrated little understanding or appreciation of the complexities that outwardly insignificant changes could impose on a system.

7. Few users had received formal training in computers. Three of the users had received some college level courses in either computer languages or data processing concepts. The three users with formal training were either accountants or auditors.

8. Probing for more information by intermediaries was found to be more characteristic of bibliographic than data processing settings. An exception to the data processing finding was the computer service bureau. Probing to find out what was needed by users was important to this organization because, unlike the other data processing organizations, service bureau users were individuals outside the intermediaries' organization. A variety of organizational factors such as size, structure, participants organizational role, and organizational attitudes about the function of the data processing unit served to constrain the intermediaries from probing.

Relevance Variables

1. Feedback from users usually took the form of a complaint when a system or program failed to operate properly.

1 Other Findings

1. There was a high rate of personnel turnover in many data processing organizations.

2. Charging users for the use of the computer affected the negotiation process. In bibliographic settings, when users were required to pay for the searching, there was significant concern about the cost of searching. In bibliographic settings, when users were not required to pay searching costs, the negotiation sessions took longer and were generally more comprehensive. When users were paying for services they were willing to accept less perfect results.

3. Useful documentation of programs and systems was practically non-existent. Each organization expressed awareness of the documentation problem but none had a solution.

1
Research Question #1

How did organizations define the information needs of their computer users?

This study found that organizations defined the information needs of their users in the following ways:

1. Large organizations tended to have written guidelines for the participants to follow
2. Large organizations had administrative procedures to control the process of approval/denial of requests for work
3. Smaller organizations had less structured procedures and guidelines or none at all
4. Organizations providing bibliographic data base services had guidelines and procedures but had almost no administrative approval constraints
5. Charging users for the cost of searching in bibliographic settings appeared to affect adversely the participants interaction
6. Profit-making organizations approached the process with less concern for adherence to administrative procedures than government organizations. It should be noted, however, that the profit-making organizations studied were small in contrast to the government organizations which were large

1 Research Question #2

What are the communication characteristics of the participants in the process of defining computer users' information needs?

This study found the following communication characteristics in the participants of the process:

1. Information needs were almost always discussed in face to face interactions, usually in the users' work areas. Exceptions were found in bibliographic settings where users came to the intermediaries' work spaces or where the interview was conducted over the telephone
2. Determining the users' information needs involved probing on the part of the intermediary
3. Face to face interactions took from one half hour to two hours for the first meeting
4. Communication during the process could be characterized as iterative. That is, there was frequent restatement of the user's question or need. The goal of this activity appeared to be: (1) to provide the intermediary with a better understanding of the user's problem and (2) to arrive at a solution for solving the problem. Factors such as cost, time, workloads, interpersonal conflicts, and social/organizational barriers inhibited the completion of the process.
5. Communication usually took some form of dominant-subordinant interaction. In non-profit data processing settings intermediaries usually appeared to be in a subordinate role. In bibliographic settings the roles appeared to be reversed; i.e., users were in the subordinate role. Participants in the

process in profit-making organizations tended to approach the process as equals.

1 Research Question #3

What indicators are used by the users and intermediaries to evaluate the quality of the output they receive?

This study found the following indicators were used to evaluate the output they received:

1. Delivering output when it was promised seemed to be a factor employed by users to evaluate quality. When output was not delivered on time or deadlines not met some users became dissatisfied
2. Users responded that accurate output was the rule rather than the exception. Several user still checked reports for accuracy, indicating that accuracy was a factor in judging quality
3. When reports were delivered that were incomplete users expressed dissatisfaction. When systems did not have all the characteristics users expected they were dissatisfied.

1

CHAPTER I V

1

DISCUSSION OF THE RESULTS

1 Introduction

This chapter presents a brief summary of the way this project was conceived and conducted, a general discussion of the results, interpretation of those results, a brief critique of the project, and some suggestions for further research.

1 Project History

This project began nearly two years ago as an attempt to learn how to better satisfy the information needs of the users of an information system with which the researcher was involved. An early computer search of the literature in ERIC uncovered numerous articles that dealt with the problem of finding out what people need to know but very little about what took place when computers were involved. Based on the lack of information in the literature and a need to know more about the process this study was undertaken.

Organizations were identified as likely candidates for visits and letters sent to them outlining the project and requesting their participation. Follow up telephone calls were conducted in early September of 1981 and arrangements made for visits. Interviews and observations were conducted

at six sites in the Sacramento-Davis area during September.

The months of October, November, and December were spent analyzing the results of the data collected and writing up those findings. The bulk of the work from these three months is found in Chapter Three.

General Discussion

This study sought to identify some of the variables that affect the process of defining information needs of computer users. To accomplish that task six organizations in the Sacramento-Davis area were visited and their user interview process investigated. The organizations may be described as follows:

1. Two large government organizations
2. A medium sized profit-making food processing organization
3. One bibliographic data base setting where users paid for computer services
4. One bibliographic data base setting where users did not pay for computer services
5. A profit-making computer service company

Thirty five people were interviewed who either had organizational responsibility for the process or were participants. Four observations were made of the process.

Organizations were visited for a maximum of two days during a two week period in mid-September of 1981.

This sample should not be taken as representative of all the types of organizations using computers. Nor should the sample be considered as representative of each type of organization investigated. Neither should the population interviewed be considered a representative sample of all computer users. However, the selection of several types of organization and a interviews with thirty-five experienced managers, intermediaries, and users makes possible conclusions in response to the research questions posed in Chapter One.

The following section will present discussion and interpretation of the more important findings.

Discussion of the Results

Organizational Variable Finding #5 (p.169) indicates that intermediaries in large organizations tend to be cut off from their users work and subsequently have a difficult time being knowledgeable about the programs/systems they are required to support.

This finding combined with Organizational Variable Finding #7 (p.169) indicates that where intermediaries and user work closely together both are more satisfied with the work done by the intermediary. Knowledge gained through close working arrangements also helps intermediaries to anticipate future needs and addresses the need expressed by managers in Organizational Finding #1 (p.173). This finding stated that managers needed to know, in advance, what was going to be requested in the future in order to plan. Intermediaries working closely with users would be in a position to facilitate processes such as defining future needs between user units and data processing managers.

The existing research, reviewed in Chapter One, focused on interpersonal and procedural variables that influenced how users and intermediaries would interact. Taylor (1968) focused mainly on the effects of steps leading up to the interview and interpersonal influences. Carmon (1975) focused on the interpersonal variables. Both researchers were concerned with the process in a literature searching (bibliographic) setting. It is now clear that organizational size is an additional factor affecting interpersonal communication. In small organizations there appears to be more frequent social, as well as professional, interaction. Large organizations have more administrative

and procedural controls that the participants must follow. It seems that these procedures, while providing control and information to the organizations managers, acts as an inhibitor to interpersonal communication between the participants.

Probing was found to be an important ingredient in the process of defining information needs. Intermediaries who were librarians or bibliographic data base searchers tended to probe more than intermediaries in other settings. This finding suggests that there are both organizational and interpersonal constraints as well as factors in training that effect probing. The previously mentioned strategy of putting the participants into closer working conditions would help to eliminate some of the organizational interpersonal barriers to probing. Training for programmers and analysts in the interpersonal skills necessary to become effective intermediaries would be a helpful addition to the curriculums of computer science departments.

There appears to be a fundamental communication/control difference between the use of computers in bibliographic and data processing settings. In a bibliographic setting the user has very little control over the contents of the data base being searched, the strategy used to search, or the way the search results will look.

On the other hand, users of organizational computers usually had some control over the data they wished to use and possessed expert knowledge about its contents and the way reports from the data base would look. Intermediaries in the data processing setting, performed a different function from intermediaries in the bibliographic settings. They (1) defined information needs, (2) defined the requirements for a modification to an existing system, or (3) provided management information reports for organizational decision making. Of these three types of definition processes in data processing settings, the third most closely resembles the process in bibliographic settings. However, organizational intermediaries, unlike librarians, are not trained to seek out their users needs. Also organizational barriers frequently prevent them from asking the necessary questions.

A related finding concerned the problem of dominant-subordinate communication roles. It was particularly interesting to find that intermediaries in both settings were perceived as having expert knowledge about the computer. However, bibliographic intermediaries were held in high esteem while organizational intermediaries were viewed as being in a subordinate, service-oriented role. This finding could be attributed to several factors. One

factor is the ownership and knowledge of the data. In a library the intermediary is the expert about not only the data contained by the system but also on how to search the system. In organizations the user usually has the expert knowledge of the contents of the data base and in some cases jealously guards that knowledge. Another factor could be the fact that the programmers and analysts are a relatively new phenomena in organizations. The data processing unit of most organizations developed as small units within accounting, administrative, or business offices and were rarely found to receive recognition in relation to their current importance to the functioning of the organization.

Dominant-subordinate communication practices are not always synonymous with effective communication. The elevation of data processing managers to the highest levels of organizational management might help balance the communication roles. Creating systems of joint ownership of systems, as mentioned before, would also help to create a climate more conducive to effective communication.

This imbalance also suggests a redirection in training for intermediaries in the art of question negotiation as practiced by librarians.

A paradox uncovered by this study is that many intermediaries in data processing settings have responsibility for systems yet they do not feel any ownership of these systems. They are prevented from feeling ownership by the organizational barriers to interpersonal communication.

Problems Encountered and Suggested Solutions

While undertaking this study some problems were encountered which should be addressed in future studies. This section will identify those problems and recommend some solutions.

Arranging to observe the process of defining needs presented problems. This was due to: (1) meetings not taking place during the site visits, (2) the spontaneous and informal nature of many of the meetings, and (3) the sensitivity of the information being discussed. To overcome these difficulties future researchers should make site visits of longer duration, be available on short notice, and clearly establish a climate of professional confidentiality and trust with the participants.

Though only six sites were visited and thirty-five persons interviewed the amount of data collected became somewhat overwhelming. Researchers who seek to use open-ended

interview schedules to collect interview data should explore the possibilities of using text editors/managers to store the data as it is collected. Once stored in computer files the interview data can be more easily processed and analyzed. The development of narrative descriptions of each site would be greatly facilitated by having the initial interview descriptions stored in computer files.

Suggested Research

This study uncovered several areas for future research. Of particular interest is the importance of the dominant-subordinate roles of users and intermediaries in various computer settings. Moore, et al, (1977) suggested further modeling of peer and superior/subordinate dialogue to improve our knowledge of man-machine communication. This study has found a need for similar research in the person-person communication that precedes man-machine interaction.

Because this study was unable to conduct sufficient observations for determining information needs and the absence of research on the topic in the literature, it is suggested that further research be conducted that examines this process in data processing settings. Longitudinal

studies of the ways users and intermediaries interact in various organizational settings would contribute to our knowledge of how the process differs across settings.

Conclusion

Computers have become a major capital asset of many organizations today. The personnel costs to maintain systems are growing. For organizations to most effectively utilize their assets and personnel requires effective communication between the users of the systems and the technologists (intermediaries) who operate them. Intermediaries can be trained in the art of better communication with their users and organizations can create climates more conducive to effective communication. Intermediaries in organizations would do well to study the practices of librarians to learn more about the process of finding out what their users need to know.

1

APPENDIX A

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1

Sample Negotiation Session

Librarian: Hello, Dr. Johnson. I understand that you're interested in a computer search.

User: Yes, What do I have to do?

Librarian: First, complete the search request form and then I'll discuss the search with you. [User completes form.]

Librarian: OK, you're interested in references about chlorophyll fluorescence polarization published during the last twenty years. Your explanation is clear -- you desire a list of articles (experimental or theoretical) dealing with the polarization of fluorescence from chlorophyll either in solution, in micelles, or in vivo.

User: I couldn't think of any related topics that might not be of interest. I do know of two authors, J.C. Goedheer and G.R. Seely, who have done some work in this area.

Librarian: Fine. This is a good question for a computer search because we can easily combine the various concepts and do so quickly. A manual search would be difficult and time consuming.

User: I thought BIOSIS would be a good source to check.

Librarian: Yes, that would be the best source. Online, though, we only have available 1972 to date. We can see what results you get by checking the references that we'll locate and their footnotes. If you desire additional coverage at that time I'll check Biological Abstracts for relevant references back to 1957.

Let's look at a sample entry of BIOSIS -- in the computer and printed forms. You're familiar with the entry in the printed product and the various printed indexes?

User: Yes, I am.

Librarian: This is how the computer entry looks: First, it lists the volume number of Biological Abstracts or year of Bioresearch Index and the abstract or item number. This information is provided in all print formats in the system we will use, so you can always refer to the printed abstract if necessary. Second, the article title is listed. We can search for any work that appears in the title, which can be very helpful. Although in the case of BIOSIS this access to the words in the article title is also possible in the hard copy, that is not true for most other data-bases. Third, it lists the authors. We can search on the author names. If

we're not getting the best results when we're online, we can search under the two authors' names that you provided. Also, we should be sure that we're getting articles written by these authors. Only initials are used for authors' first and middle names and no work affiliation is provided, so if there are two G.R. Seeley's we will not be able to distinguish between them. Fourth, the source is listed: For example, the journal title (in abbreviated form), volume number, issue number, year, inclusive pages, and CODEN.

I'm glad to see that you will accept publications in all languages, because the language information is not in the computer file for this database. Fifth, the descriptors are listed. These are subject headings used to describe the contents of the article, and we can search for any of them. They are not available in the printed index and thus we have more effective access to the information in the computer file. Sixth, the cross codes are listed. These generally represent broader concepts than the descriptors and are available for searching in both the printed and computer versions. While it is a difficult task to check these codes manually, they can be checked easily online. The asterisk indicates a major emphasis in the article, so if we use cross codes, we have the option of searching comprehensively or narrowly. Seventh, the biosystematic codes are listed. Although your search won't require the use of these codes,

they are the most efficient and thorough method of search for organisms if a code is available. An asterisk here denotes a new taxa.

That's the information file that is accessible for searching. Now let's consider the various concepts that make up your question.

One concept is chlorophyll.

User: Yes. And, I would like to include bacteriochlorophyll also.

Librarian: OK, we should include that, too. Let's check the vocabulary guide. Yes, chlorophyll is a term used as a keyword, i.e., as descriptor. Chlorophylls is also used. Do you want to use that, too?

User: No.

Librarian: Let's look for bacteriochlorophyll. The vocabulary guide indicates that bacterio is used as a keyword in the form of a fragment appearing with chlorophyll or phage. We would automatically get all those references when searching under chlorophyll, but it might be interesting to see what we pick up under that specific term. We have to treat bacteriochlorophyll as two words. We can require that bacterio and chlorophyll be adjacent to each other. That's known as free text searching. The list

refers us also to Bacteria or Bacterium. I assume you're not interested in those term.

User: Right.

Librarian: So we have: chlorophyll OR bacterio (adjacent to) chlorophyll. The "OR" is used to combine synonymous phrases.

Another concept deals with fluorescence.

User: We should also consider phosphorescence.

Librarian: OK. Let's check the vocabulary guide for both terms. Under fluorescence the guide shows that fluorescen\$ (truncated after the n to cover variant endings) is a keyword that we can search under in the descriptor field. Phosphorescence is not listed in the guide, but we can use it as a free text searching term and possibly truncate it also after 'n'. So, we will use: fluorescent\$ or phosphorescen\$.

The third concept is polarization. Under polarization in the vocabulary guide, polariz\$ (truncated after z) is used as a keyword. Are other forms of polarization, e.g., polarized, used for this purpose?

User: No, I prefer to use the full term, polarization.

Librarian: Sometimes it's hard to predict the form of a term. I would suggest that we use the truncated version.

User: OK, if you think that's best.

Librarian: Now, if we combine all three concepts, we are asking for: [chlorophyll OR bacterio (adjacent) chlorophyll] AND [fluorescen\$ OR phosphorescen\$] AND [polariz\$]

The AND is used to indicate that the concepts thus connected must all be present. So our set reads: we will accept either chlorophyll OR bacterio (adjacent) chlorophyll AND either fluorescen\$ OR phosphorescen\$ AND polariz\$. Does that seem correct to you?

User: Yes.

Librarian: Would you be able to come along with me to do the search? It would give you a chance to see the system operate.

User: Fine, I'd like to do that.

Librarian: When we're on the terminal, I will type in each search term. The computer will search for each term and indicate how many references in the total file (back to

1972) include that term. Often the number of references is quite high. But, after we combine the terms with OR's and AND's, the number can be much less. After we have completed the combining, we should look at a few references to see if we're getting relevant hits. We can look at just the titles, which takes less time but does not provide the descriptors and other information that would enable us to find other possible search terms or identify problem categories.

User: I know the field rather well, so let's initially just ask for titles.

Librarian: OK, then we can always ask for the more comprehensive listing on selected references if we desire.

We have the option of printing references online or offline. Online costs us computer connect time. Do you expect that we will get many hits?

User: No, probably less than twenty.

Librarian: If we ask for an offline print, the references will be printed tonight and mailed to us. How soon do you need the information?

User: Quite soon, and I don't care how much it costs.

Librarian: Then we should consider printing online, unless we get an unexpectedly high number of references. If cost is not a problem, we should also printout the full format.

User: Fine, I understand. When can we do the search?

Librarian: How about this afternoon? That would give me a chance to double-check our strategy.

User: Any time after 2:30 is fine.

Librarian: Then let's make it for 2:30. I'll meet you here.

User: Great. I'll see you then!

APPENDIX B

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CALIFORNIA STATE UNIVERSITY, SACRAMENTO

6000 J STREET, SACRAMENTO, CALIFORNIA 95819

DEPARTMENT OF COMMUNICATION STUDIES

August 29, 1981

Dear

I am an information systems manager with the State Department of Education and a graduate student in communication studies at California State University, Sacramento. As an information systems manager one of my tasks has been to insure that my users get what they asked for. I have discovered, however, that what users ask for is not always what they want. A clear case of misunderstanding which can result in upset clients and programmers. To find out more about what causes those misunderstandings and what can be done to minimize them I am conducting a research project through the Communication Studies Department at CSUS.

To gather data for the study I will be visiting organizations between Sept. 15 and Sept. 25. I would like to visit with your organization as part of this research. The visit will last about two days and consist of the following:

- talking with you and several of your staff
- talking with several of the users of your services
- observing the work of defining output requirements
- obtaining copies of guidelines and forms you use to specify requirements

To protect individual and organizational identities the data in the study will be confidential. I will, of course be glad to share the findings and recommendations with you and your staff.

Thank you for taking the time to read this letter. I will call you in the first two weeks of September to schedule a visit and to answer questions.

Sincerely,

Ken Kimbrough

Ken Kimbrough

362-7897 evenings

322-3356 days

THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

APPENDIX C

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Page _____

Unit _____

Sept _____

MA IN US

I. Organization - size, type of services, number of personnel, goals, priorities.

II. Unit - size, types of services, number of personnel, computer/information system used.

1. goals and priorities

2. procedures/feedback

3. work in progress

Page _____
Unit _____
Sept _____
MA IN US

I. Organization

1. Describe the kind of work your unit does.

2. What is your role in the unit?

3. What do you think are your units goals and priorities?

4. Do you work with several units?

5. How long have you been with this unit? organization? in this job?

6. Are you able to learn much about your clients work?

II. Defining Requirements

1. Describe, in general terms the process of defining output requirements.

2. Are there any procedures/guidelines? forms?

Page _____
Unit _____
Sept _____
MA IN US

3. Do the users have any forms or procedures you know of?
4. How often do you typically meet during the process of defining a report?
5. Do you communicate over the phone about your projects? how often?

III. The Meetings

1. Describe the first meeting in general terms. long/short? how long? does anyone fill out forms? deadlines discussed?

Page _____

Unit _____

Sept _____

MA (IN) US

IV. Evaluation/feedback

1. Do you have any system for finding out how your users react to the product or system delivered?

2. What might be done to improve the results?

3. What might be done to improve the process?

Page _____
Unit _____
Sept _____
MA IN (US)

I. Organization

1. Kind of work your unit does.
2. What is your role in the unit?
3. How long have you been with the unit, organization, this job?
4. What do you think are your units goals and priorities?
5. What do you think are the goals and priorities of the data processing unit?

II. Process

1. General description of the process.
2. Types of interaction. (meetings, phone calls, formal/informal)
3. First interview. (length, probing, negotiation)
4. System knowledge - what is your background in d.p.? how attained? usefulness?

Page _____

Unit _____

Sept _____

MA IN JS

4. System knowledge - what is your background in d.p.? how was it attained?
usefulness.

5. Intermediary knowledge - does the intermediary know your business? Is it
necessary, or helpful?

III. Evaluation/feedback

1. Overall rating of the quality/relevance of the output received in the users
words. What criteria is used?

2. Elaborate on timeliness.

3. Elaborate on completeness.

4. Elaborate on accuracy.

5. Do you let the intermediary know about your evaluation? Explain/describe
(is it formal/informal, well received? not wanted?)

Page _____

Unit _____

Sept _____

MA IN US

Begin time _____

End Time _____

ET _____

of part. _____

OBSERVATION INSTRUMENT

1. How much probing is taking place

2. What topics are discussed? System limits? Capabilities? Who needs the report?
Clients operations?

3. Who is doing all the talking?

4. Is there feedback or relevance judgement being transmitted?

5. Is the intermediary getting the feedback?

6. Are forms being used?

7. Are people taking notes?

APPENDIX D

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University of California, Davis



automated information retrieval services

Computerized literature searching is offered by reference librarians in both the Biological & Agricultural Sciences Department and the Humanities/Social Sciences Reference Department located in Shields Library, and also in the Physical Sciences Library and the Health Sciences Library. This service uses machine-readable versions, called data bases, of standard indexes and abstracts in a wide range of subject areas. Ask at any Reference Service Desk for specific details about individual data bases and their subject coverage.

Since producers of indexes did not utilize machine-readable tapes until the late 1960's, a computer search cannot locate "everything written" on a particular subject, but can be as comprehensive as the printed index in retrieving articles published in the period covered by a particular data base. In most cases, the material searched by computer is also available for manual searching in the various reference collections on campus. However, computerized literature searching can save many hours of manual searching and can be especially effective in gathering material for term papers, reports, conference papers, theses, and research proposals. The computer can search an enormous amount of material in a matter of minutes, thus enabling the researcher or student to spend time analyzing existing material rather than merely locating it. A computer search can also save hours spent in copying citations, since a printed bibliography on the subject is supplied as the end product of the search.

Searches are done at a computer terminal in the library. Telephone lines are used to communicate with the computer, and search terms are entered and correlated by a librarian trained in computer searching.

Advantages of Automated Literature Retrieval

Computerized literature searches are particularly valuable in the following situations:

1. When the subject being searched involves coordination of several concepts. For example: the effect of pollen receptor cells on pollen tube growth, or the effect of educational television on biological education of elementary school children.
2. When the subject is usually described by words or phrases that are buried in the larger subject terms used in the printed indexes. For example: *Psittacus krameri*, or all occurrences of a specific disease. A computer search can supplement the established subject headings used in an index through the use of key words or phrases.
3. When the topic may be stated in so many synonymous ways that manual searching may be extremely time-consuming. For example: *Alzheimer's disease* may be expressed in at least a dozen different ways, including *senile dementia* and *senile dementia of the Alzheimer type*.
4. When it is important to retrieve papers written by a particular author.
5. When it is important to be kept informed on a continuing basis of new articles being published on a subject of long-term research interest.
6. When it is important to learn about research in progress that is not yet covered in the published literature.
7. When it is important to determine that little or no research has been done on a subject.

Limitations of Computer Searching

It is important to keep in mind, however, that computerized literature searching does have some limitations.

1. The computer cannot separate the varying contexts in which particular terms may be used. For example, a search correlating the terms *shrimp* and *nutrition* will retrieve articles on three disparate subjects: a) what is nutritious to the shrimp, b) nutritive livestock feed supplements made with waste from shrimp processing factories, and c) the nutritive value of shrimp as a food for humans. Sometimes, but not always, unwanted material may be eliminated by the use of thesaurus terms or numerical codes.
2. The computer cannot distinguish logical relationships. In searching for the *value held by children*, the computer will also retrieve articles on the *value society attempts to instill in children*.
3. The computer cannot distinguish between variant meanings of the same word. For example, the term *nut* will retrieve both the nut and the wood.
4. The computer cannot correct misspelled words. It is important to make sure that all terms are spelled correctly.
5. The computer cannot find all synonymous words or all specific instances of a general concept such as *physical properties*. All specific physical properties must be specified. Likewise, the term *woody plants* will pick up instances of that phrase but not occurrences of specific woody plants.
6. The computer cannot easily limit a search to a specific geographic area, although some data bases have added geographical descriptors in the last few years.

Types of Searches

RETROSPECTIVE This is the most frequently requested type of search. The user will get a bibliography consisting of all citations from one or more data bases on a particular subject. The bibliography, especially if it contains only a few items, can be printed in the library at the time the search is done or, more commonly, will be printed off-line at the computer site and mailed to the library. Upon request, the user will be notified when the bibliography has been received.

CURRENT AWARENESS For on-going research projects, users may wish to have continually updated information on a particular subject. In this case, the user specifies search terms as in a retrospective search and enters a subscription to one or more data bases. The data base(s) will then be searched automatically each time new material is added, and the resulting bibliography mailed to the user.

Prices

RETROSPECTIVE Because the library must pay commercial suppliers for computer data bases, these direct costs are passed on to the user. The retrospective literature search depends on:

- 1) the per minute rate charged by the supplier for the time the library's computer terminal is connected to a particular data base, and
- 2) the charge per citation for bibliographies printed and mailed to the library.

Each data base has a per minute rate for access (ranging from \$0.35 to \$1.67) and a per citation charge that varies from 2.5 cents to 25 cents for printing bibliographies. For those data bases where citations with abstracts are an option, there is an extra charge (usually double the price per citation) for the abstract.

Thus, the price of a computer search depends on the number of terms entered and the time it takes to combine them to produce a useful bibliography, and the number of items retrieved by the search. A search on diseases of tomatoes may take only two or three minutes of computer time but may generate a long (and expensive) bibliography. The computer search card file at the various Reference Service Desks details standard charges for each data base.

Most searches are done for an average cost of \$15 to \$20, including the bibliography. If you would like to consult with a reference librarian trained in computerized literature searching about an estimated cost for a particular search, ask at the appropriate Reference Service Desk. Although the librarian can make an estimate prior to the search, the exact cost is based on the above factors and cannot be determined until the search has been completed. The exception to this is the federally subsidized MEDLINE data base, for which there is a standard flat rate schedule. A copy of this rate schedule is available in the Reference Service Desks in the Biological & Agricultural Sciences Department, Life Sciences Library, and in the Health Sciences Library.

CURRENT ACCESS Subscriptions for current awareness service may be entered for some, but not all, data bases. Charges for this service consist of:

- 1) the cost of online time for entering the search strategy in the chosen data base, and
- 2) a subscription fee, which depends on the data base selected and on the number of citations retrieved per issue searched.

Typically, subscription rates range from \$1 to \$150. Annual subscriptions are available by special arrangement.

Methods of Payment

Three methods of payment are available:

- 1) Personal check or money order (made payable to The Regents of the University of California).
- 2) Departmental recharge. Users who have been authorized to use departmental accounts must supply the departmental identification number.
- 3) Billing through the Campus Accounting Office. The user must indicate the full name and address of the individual or organization to whom the cost of the computer search is to be charged.

NOTE: The Reference Service Desk cannot accept cash payments.

How to Request a Computer Search

1. Inquire at the nearest Reference Service Desk to determine if there are data bases with material relevant to your subject.
2. Examine the printed versions of selected data bases to insure that items of interest are indexed there.
3. Obtain a Computer Search form from the librarian at the Reference Service Desk and fill it out. If necessary, make an appointment so that your search can be run in your presence.
4. In preparation for your search, it is helpful to bring a few articles representative of the kind you wish to find.
5. Scanning a few volumes of an appropriate index can give you a better idea of the extent to which your subject is documented in the literature and which subject headings and keywords were used.
6. A list of terms, synonyms and expressions commonly found in the articles about your subject can make the search more thorough since the computer can search titles and abstracts, too.
7. Be prepared to be very specific and precise about your search topic. Know what to include and what you want to exclude.

Search Results

You may expect that your bibliography will be ready within a week after the search request has been submitted. If you need the material sooner, please indicate this on the Search Request form.

CAB ABSTRACTS CITATIONS

SAMPLE RECORD

860940 Q0029-04604

On the variation in maize grain veriously corrected during chelling.
Piva, G. ; Morandi, A. ; Senti, E. ; Anario, M.
Istituto di Zootechnica, Universita Cattolica del Sacro Cuore, Milan,
Italy.

Anelli della Facolta di Agraria, Universita Cattolica del Sacro
Cuore. 1973, publ. 1975. 13,1/3. 834-872

Each citation on a CAB printout has a 10-digit record number which enables one to locate the corresponding abstract. The first two digits of the number tell which abstracting journal the citation is from. The remaining digits refer to the volume number and abstract number of the individual citation.

e.g. Q0029-04604 is Field Crop Abstracts, Vol. 29,
Abstract Number 4604

The table below should be used to interpret the first two digits of the record number. Abstracting journals are located in the Bio/Ag department unless otherwise noted.

SUBFILE CODES	CAB ABSTRACTS	CALL NUMBERS
AD	Animal Breeding Abstracts	87105.15
BD	Agricultural Abstracts	87321.4635
CD	Horticultural Abstracts	804.15
DD	Dairy Science Abstracts	87221.125
ED	Review of Applied Entomology	88599.83
	A. Agricultural Entomology	
FD	Forestry Abstracts	801.857
GD	Herbage Abstracts	80193.14
HC	Horticulture Abstracts	801.84
	A. Animal & Human	
	Hygiene Abstracts	
JD	Index Veterinarius	87601.14
JO	Review of Applied Entomology	80599.731 Stocks 1913-72
	B. Med & Vet Entomology	807.201.042.45
LD	Review of Med. & Vet. Mycology	807.201.0400
MD	Review of Plant Pathology	80599.837
ND	Review Abstracts & Reviews	80214.07 Table 5
	B. Livestock Feeds & Feeding	
PD	Animal Breeding Abstracts	80123.10
QD	Field Crop Abstracts	80182.06
RD	World Agricultural Economics	25074.03.06 1/53
SD	Rural Sociology Abstracts	8562.125
TD	Soils & Fertilizers	801.84
UD	Microbiology Abstracts	
	A. Plant Microbiology	
VD	Nutrition Abstracts & Reviews	80214.07 Table 5
WD	Veterinary Bulletin	87601.15
XD	Water Abstracts	80211.01
YD	Physiological Abstracts	not available

W/SS - Humanities/Social Sciences Reference Dept.
WBL - Humanities Sciences Library

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NATIONAL NEWSPAPER INDEX

NATIONAL NEWSPAPER INDEX covers three important newspapers read nationwide: the New York Times (City edition), the Christian Science Monitor (Western edition), and the Wall Street Journal (Western edition). All articles, news reports, editorials, letters to the editor, obituaries, columns, biographical pieces, reviews, and illustrations are indexed. The subject coverage of the newspapers includes the following topics:

Current Affairs, National and International
Business and Economics
Education and Cultural Events
Health and Medicine
Consumer Product Evaluation
Society and the Individual
Environmental Issues
Performing Arts and Literature
Science, Technology, Agriculture
Travel, Sports, Leisure

Online NATIONAL NEWSPAPER INDEX corresponds to the microfilm product, National Newspaper Index, produced by Information Access Corporation. Coverage is from 1979 to date. NATIONAL NEWSPAPER INDEX contains approximately 180,000 records per year of coverage.

On Lockheed DIALOG, a typical unit record would be:

DIALOG Accession Number

1245371
Politics, promises and three plans for tax relief.
AU→Hershey, Robert D., Jr.
JN→New York Times v129 Section 3 pF1 AUG 31 1980 CODEN: NYTIA
CI→col 3 040 col in. illustration; photograph
ED→EDITION: Sun
SL→DATELINE: Washington
NAMED PEOPLE: Carter, Jimmy, Pres., U.S.-economic policy; Reagan, Ronald-economic policy; Long, Russell-economic policy
DESCRIPTORS: presidents-campaigns; taxation-political aspects; United States.
CONGRESS-economic policy
IDENTIFIERS: tax reform-political aspects
AU - Author
CI - Column Inches
CO - CODEN
ED - Edition
JN - Newspaper Name
PD - Publication Date
PT - Publication Year
SF - Special Feature
SL - Source Location
DE - Descriptor
ID - Identifier
NA - Named Person
TI - Title

Most articles in NATIONAL NEWSPAPER INDEX are available through your library. For more information, consult your librarian.

LS 7-81

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FWA 010—347-3332

ABI/INFORM

ABI/INFORM database selectively covers over 400 periodicals in the fields of business and economics. Information that is transferable from one industry to another is stressed; specific information on products or companies is included but does not receive primary emphasis. Topics covered include:

- Business Management
- Accounting
- Advertising
- Banking
- Data Processing
- Employee Benefits
- Taxes and Taxation
- Finance
- Insurance
- Labor Relations
- Market Research
- Personnel
- Pensions
- Planning

ABI/INFORM exists in computer form only and has no published counterpart. Coverage is from 1971 to date. ABI/INFORM contains approximately 14,500 records per year of coverage.

On Lockheed DIALOG, a typical unit record would be:

DIALOG Accession Number

7200000 11000 7200000
 PY: 5,000,000 11000 7200000
 AU: 5,000,000 11000 7200000
 JN: 5,000,000 11000 7200000
 CO: 5,000,000 11000 7200000
 JC: 5,000,000 11000 7200000
 SN: 5,000,000 11000 7200000
 DT: 5,000,000 11000 7200000

AU = Author
CO = CODEN
DT = Document Type
JC = Journal Code
JN = Journal Name
PY = Publication Year
SN = ISSN Number

AB - Abstract
DE - Descriptor
TI - Title

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Exhibit M - Processing Environment Factors

PROCESSING ENVIRONMENT FACTORS

Will the system be run in the Districts and/or in Headquarters?
Who will be using the reports and other output?
How often will the system be run?
Where does the raw data come from?
What hardware will be used in running the system?
How much of the system will be run by the user department?
What type and extent of user interface is required?
How much user training will be necessary?
Will pre-printed forms be used?
What are the processing cycles?

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Exhibit N - System Controls Factors

SYSTEM CONTROL FACTORS

What are the cutoff dates which must be set?
Which specific fields are to act as controls?
What controls from other systems must be watched?
Which controls must be checked by users?
Which controls must be checked by Data Guidance?
What are required data security measures such as passwords, etc?

APPENDIX E

California State Board of Equalization
1020 N St.
Sacramento, CA 95814

California Employment Development Department
800 Capitol Mall
Sacramento, CA 95814

California Department of General Services
400 Capitol Mall
Sacramento, CA 95814

California Department of Health
Mental Hygiene Research
744 P St.
Sacramento, CA 95814

California Department of Motor Vehicles
2415 First Ave.
Sacramento, CA 95818

California Department of Transportation
(CALTRANS)
1120 N St.
Sacramento, CA 95814

California Franchise Tax Board
Aerojet Center
Sacramento, CA 95857

Cal-Western Life Insurance
2020 L St.
Sacramento, CA 95804

Aerojet General Corporation
Computing Science Dept.
Sacramento, CA 95813

Electronic Data Processing
2110 K St.

Sacramento, CA 95816

Systems Data Processing Corporation
701 Howe Ave.
Sacramento, CA 95813

Teichert and Sons, Inc
Box 1500
Sacramento, CA 95813

University of California, Davis
The Library
DORS Committee
Davis, CA

California State Library
Administrative, Legislative
Reference Section
Supreme Court Building
Sacramento, CA 95814

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